OPERATING MANUAL

INTERCEPTOR 264

CHANNEL ACCESS MONITOR

Telecommunications
Techniques
Corporation

A DYNATECH COMPANY

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Codex

Revision B

INTERCEPTOR 264
CHANNEL ACCESS MONITOR

JANUARY 1990

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SECTION 1

GENERAL INFORMATION/ PREPARATION FOR USE

1.1 INTRODUCTION

This operating manual contains information about the INTERCEPTOR 264 Channel Access Monitor manufactured by the Bradley Division of Telecommunications Techniques Corporation. Specifically included are operating instructions and specifications for the INTERCEPTOR 264.

This section of the manual provides a general description of the instrument, including an instrument overview, unpacking and initial inspection instructions, warnings, and power requirements.

1.2 INSTRUMENT IDENTIFICATION

An identification sticker is attached to the side panel of each INTERCEPTOR 264. The sticker bears the serial number assigned to the instrument. This serial number should be quoted on any correspondence concerning the instrument.

1.3 INSTRUMENT OVERVIEW

The INTERCEPTOR 264 is an instrument that can monitor two 2048 kb/s circuits simultaneously, as well as drop and insert one or more contiguous or non-contiguous 64 kb/s timeslots of the high-speed carrier. A variety of status indicators are provided to monitor the high-speed links and signalling.

Many advanced features are included as standard equipment in the INTERCEPTOR. These include N x 64 kb/s operation for up to 31 time-slots, VF (voice frequency) access through either 600-ohm jacks or a talk/listen speaker, a byte encoder, 1020 Hz tone generation, and signalling status display and transmission.

Various options are offered for the INTERCEPTOR. These include a 2048 kb/s Results option, a 64 kb/s G.703 Data Port option with E&M signalling option, a stand-alone E&M signalling option, a V.24 (RS-232) Printer and Remote Control option, and an IEC-625 (IEEE-488) Remote Control Port. The V.24 and IEC 625 options allow results printing and remote configuration of the unit. A history printout of the last 100 signalling events is also available.

The INTERCEPTOR is housed in a rugged case that incorporates a lid to protect the front panel when closed. Power and option connectors are located on the side of the unit. A user-accessible plug-in memory card contains all of the software needed to operate the unit, providing an easy way to upgrade the INTERCEPTOR as features are added or industry standards change.

The INTERCEPTOR front panel is designed for quick set-up and easy access to results. The instrument features a combination of pushbutton switches and menu formats to facilitate complex test configurations, and an alphanumeric display which can show two sets of results simultaneously. Indicators such as labeled LEDs, panel labels with backlighting, and LED-illuminated switches keep the user constantly informed of test parameter changes and error or alarm conditions.

In addition to the INTERCEPTOR's current capabilities, its flexible architecture and advanced 80186 16-bit processor are designed to accommodate upgrades as standards change or as new features and capabilities are added. A separate, easily accessible EPROM module permits software upgrades to be performed by the user. These features make the INTERCEPTOR the complete Channel Access Monitor for present and future testing needs.

1.4 PREPARATION FOR USE

1.4.1 Unpacking and Initial Inspection

The shipping container should be inspected for damage when it is received. If the shipping container or shipping material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. Procedures for checking electrical performance are given in Section 2. If the contents are incomplete, if there is mechanical damage or defect, or if the

INTERCEPTOR does not pass the performance tests, the customer should notify Bradley. If the shipping container is damaged, notify the carrier as well as Bradley, and keep the shipping container and materials for the carrier's inspection.

1.4.2 Equipment Included

The following equipment is supplied with each unit:

- Power Cord
- Operating Manual
- Front Cover

1.4.3 Warnings

The following precautions must be observed before and during all phases of operation of the instrument. Failure to comply with these precautions or specific warnings elsewhere in the manual may cause physical harm to the operator or to the instrument. Bradley assumes no liability for the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis must be connected to an electrical ground. The instrument is equipped with a three-conductor AC power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adaptor with grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

USE PROPER LINE VOLTAGE SETTING AND FUSE SIZE

Before connecting the AC power cord, verify that the line voltage selector switch is positioned for the correct operating voltage and that the fuse holder is rotated for the voltage desired. Never operate the instrument with the incorrect fuse size.

KEEP AWAY FROM LIVE CIRCUITS

Do not remove instrument covers or insert fingers or other objects through bottom panel holes while power is applied to the instrument.

DO NOT OPERATE IN AN AMBIENT TEMPERATURE ABOVE 45° C

1.4.4 Power Requirements

The INTERCEPTOR requires a power source of 90-135 or 195-250 volts ac, single phase, 48 to 66 Hz that can deliver 120 volt-amperes (maximum). Unless otherwise noted, the instrument is shipped from the factory to operate from a power source providing 90-135 volts ac.

INSTRUMENT CHECKOUT

2.1 INTRODUCTION

This section contains procedures for performing a basic functional test of the INTERCEPTOR 264. These procedures may be used if problems are suspected in the instrument.

In addition to aiding in troubleshooting problems, these procedures are also useful for instructing technicians in the use of the INTERCEPTOR, since they exercise many of the instrument's features and functions.

2.2 TEST PROCEDURES

2.2.1 F Side Balanced Jack Test

(1) Disconnect all signal cables connected to the INTERCEPTOR. Connect a cable from the F SIDE TRANSMIT balanced banana jacks to the F SIDE RECEIVE balanced banana jacks.

(2) Press the MENU switch to select the AUXILIARY position.

(3) Press the SCROLL/RESULTS rocker switch (immediately below the left side of the display) until "CLEAR MEMORY" appears in the display. Press the MODIFY/RESULTS rocker switch (below the right side of the display) until "YES" appears in the display. Press the SCROLL/RESULTS (left) rocker switch down once so that the message "ARE YOU SURE" appears in the second line of the display. Press the MODIFY/RESULTS (right) rocker switch to confirm your intent.

(4) Press the MENU switch to select the E TO F SETUP position. Press the SCROLL/RESULTS switch until "OUTPUT CLOCK": appears in the display. Press the MODIFY/RESULTS switch to select INT (for the internal oscillator).

(5) Press the RESULTS RESET switch.

RESULT: The INTERCEPTOR is now configured to transmit an HDB3-encoded 2048 kb/s signal from the F SIDE TRANSMIT balanced jacks to the F SIDE RECEIVE balanced jacks. This signal contains framing, TS-16 multiframing, and CRC multiframing based on the internal 2048 kHz reference oscillator.

F SIDE STATUS signals should now be illuminated as shown below:

F SIDE STATUS SIGNAL	G	O
FRAME SYNC	G	O
MF SYNC	G	O
CRC PRESENT	Y	
HDB3 CODE	Y	
AIS	O	O
TS-16 AIS	O	O
FAS DISTANT	O	O
MFAS DISTANT	Y	O
64KBPS AIS	O	O
HISTORY		

KEY
R-RED
G-GREEN
Y-YELLOW
O-OFF

(6) Press the MENU switch to select the 64K RESULTS position. Verify that the displayed F SIDE TS#1 result is 01010100. Press the MENU switch to select the 2048K RESULTS position and verify the following F SIDE results:

FREQUENCY	2048000.0 ±10 Hz
FAS WORD	C0011011
NOT FAS	C1011111
FAS ERRS	0
MFAS ERRS	0
CODE ERRS	0
CRC4 ERRS	0

NOTE: The error counts listed in this procedure are only available when the Results Option is installed.

(7) Press the MODE switch to select drop and insert on the F SIDE. Press the MENU switch to select the INTERFACE position, then use the SCROLL/RESULTS switch to display "INSERT 1020 Hz TONE". Press the INSERT switch (beside the MODE switch). When the LED within the INSERT switch illuminates steadily, adjust the VOL switch until the tone is heard.

(8) With the MENU switch remaining in the INTERFACE position, use the SCROLL/RESULTS switch to display "INSERT BYTE". Press the INSERT switch and verify that the byte displayed in the INTERFACE position of the MENU area is the same as the F SIDE TS#1 result displayed when the 64K RESULTS menu position is selected. Scroll back to the INTERFACE position and modify the INSERT BYTE using the cursor (left and right arrow) keys and the MODIFY/RESULTS switch. Scroll back to the 64K RESULTS position and verify that the F SIDE TS#1 result is still the byte being inserted.

NOTE: If a VF or bit error rate (BER) test set is available, the VF and DATA PORT jacks may be tested in a manner similar to steps 8 and 9. These tests may be performed by selecting the proper interface in the INTERFACE menu and connecting the test set to the appropriate connectors on the INTERCEPTOR.

(9) Press the INSERT switch located in the SIGNALLING area of the INTERCEPTOR front panel. Verify that the A, B, C and D LEDs under the FROM F label illuminate as the TRANSMIT A, B, C, and D toggle switches are positioned. Change the TRANSMIT toggle switches and verify that the corresponding signalling LEDs change.

When completed, this procedure will have functionally tested the F SIDE of the INTERCEPTOR using the balanced inputs.

2.2.2 E Side Balanced Jack Test

(1) Disconnect all signal cables connected to the INTERCEPTOR. Connect a cable from the E SIDE TRANSMIT balanced banana jacks to the E SIDE RECEIVE balanced banana jacks.

(2) Press the MENU switch to select the AUXILIARY position.

(3) Press the E SIDE SCROLL/RESULTS rocker switch (immediately below the left side of the display) until "CLEAR MEMORY" appears in the display. Press the F SIDE MODIFY/RESULTS rocker switch (below the right side of the display) until "YES" appears in the display. Press the SCROLL/RESULTS (left) rocker switch down once so that the message "ARE YOU SURE" appears in the second line of the display. Press the MODIFY/RESULTS (right) rocker switch to confirm your intent.

(4) Press the MENU switch to select the F TO E SETUP position. Press the SCROLL/RESULTS switch until "OUTPUT CLOCK": appears in the display. Press the MODIFY/RESULTS switch to select INT (for the internal oscillator).

(5) Press the RESULTS RESET switch.

RESULT: The INTERCEPTOR is now configured to transmit an HDB3-encoded 2048 kb/s signal from the E SIDE TRANSMIT balanced jacks to the E SIDE RECEIVE balanced jacks. This signal contains framing, TS-16 multiframing, and CRC multiframing based on the internal 2048 kHz reference oscillator.

E SIDE STATUS signals should now be illuminated as shown below:

		E SIDE STATUS
O	G	SIGNAL
O	G	FRAME SYNC
O	G	MF SYNC
	Y	CRC PRESENT
	Y	HDB3 CODE
O	O	AIS
O	O	TS-16 AIS
O	O	FAS DISTANT
O	Y	MFAS DISTANT
O	O	64KBPS AIS
———		HISTORY

KEY
R-RED
G-GREEN
Y-YELLOW
O-OFF

(6) Press the MENU switch to select the 64K RESULTS position. Verify that the displayed E SIDE TS#1 result is 01010100. Press the MENU switch to select the 2048K RESULTS position and verify the following E SIDE results:

FREQUENCY	2048000.0 ±10 Hz
FAS WORD	C0011011
NOT FAS	C1111111
FAS ERRS	0
MFAS ERRS	0
CODE ERRS	0
CRC4 ERRS	0

NOTE: The error counts listed in this procedure are only available when the Results Option is installed.

(7) Press the MODE switch to select drop and insert on the E SIDE. Press the MENU switch to select the INTERFACE position, then use the SCROLL/RESULTS switch to display "INSERT 1020 Hz TONE". Press the INSERT switch (beside the MODE switch). When the LED within the INSERT switch illuminates steadily, adjust the VOL switch until the tone is heard.

(8) With the MENU switch remaining in the INTERFACE position, use the SCROLL/RESULTS switch to display "INSERT BYTE". Press the INSERT switch and verify that the byte displayed in the INTERFACE position of the MENU area is the same as the E SIDE TS#1 result displayed when the 64K RESULTS position is selected. Scroll back to the INTERFACE position and modify the INSERT BYTE using the cursor (left and right arrow) keys and the MODIFY/RESULTS switch. Scroll back to the 64K RESULTS position and verify that the E SIDE TS#1 result is still the byte being inserted.

NOTE: If a VF test set or a BER test set is available, the VF and DATA PORT jacks may be tested in a manner similar to steps 8 and 9. These tests may be performed by selecting the proper interface in the INTERFACE menu and connecting the test set to the appropriate connectors on the INTERCEPTOR.

(9) Press the INSERT switch located in the SIGNALLING area (6) of the INTERCEPTOR front panel. Verify that the A, B, C and D LEDs under the FROM E label illuminate as the TRANSMIT A, B, C, and D toggle switches are positioned. Change the TRANSMIT toggle switches and verify that the corresponding signalling LEDs change.

When completed, this procedure will have functionally tested the E SIDE of the INTERCEPTOR using the balanced inputs.

2.2.3 F Side Unbalanced Jack Test

(1) Disconnect all signal cables connected to the INTERCEPTOR. Connect a cable from the F-SIDE TRANSMIT unbalanced banana jacks to the F-SIDE RECEIVE unbalanced banana jacks.

(2) Press the MENU switch to select the AUXILIARY position.

(3) Press the SCROLL/RESULTS rocker switch (immediately below the left side of the display) until "CLEAR MEMORY" appears in the display. Press the MODIFY/RESULTS rocker switch (below the right side of the display) until "YES" appears in the display. Press the left rocker switch down once so that the message "ARE YOU SURE" appears in the second line of the display. Press the right rocker switch to confirm your intent.

(4) Press the MENU switch to select the E TO F SETUP position. Press the SCROLL/RESULTS switch until "OUTPUT CLOCK": appears in the display. Press the MODIFY/RESULTS switch to select INT (for the internal oscillator). Press the SCROLL/ RESULTS switch until "IMPEDANCE" appears in the display. Press the MODIFY/RESULTS switch to select 75 ohm UNBAL.

(5) Press the MENU switch to select the F TO E SETUP position. Press the SCROLL/RESULTS switch until "IMPEDANCE" appears in the display. Press the MODIFY/RESULTS switch to select 75 ohm UNBAL.

(6) Press the RESULTS RESET switch.

RESULT: The INTERCEPTOR is now configured to transmit an HDB3-encoded 2048 kb/s signal from the F SIDE TRANSMIT unbalanced jacks to the F SIDE RECEIVE unbalanced jacks. This signal contains framing, TS-16 multiframing, and CRC multiframing based on the internal 2048 kHz reference oscillator.

F SIDE STATUS signals should now be illuminated as described below:

F SIDE STATUS SIGNAL	G	O
FRAME SYNC	G	O
MF SYNC	G	O
CRC PRESENT	Y	
HDB3 CODE	Y	
AIS	O	O
TS-16 AIS	O	O
FAS DISTANT	O	O
MFAS DISTANT	Y	O
64KBPS AIS	O	O

HISTORY

KEY
R-RED
G-GREEN
Y-YELLOW
O-OFF

(7) Press the MENU switch to select the 64K RESULTS position. Verify that the displayed F-SIDE TS#1 result is 01010100. Press the MENU switch to select the 2048K RESULTS position and verify the following F SIDE results:

FREQUENCY	2048000.0 ±10 Hz
FAS WORD	C0011011
NOT FAS	C1011111
FAS ERRS	0
MFAS ERRS	0
CODE ERRS	0
CRC4 ERRS	0

NOTE: The error counts listed in this procedure are only available when the Results Option is installed.

(8) Press the MODE switch to select drop and insert on the F SIDE. Press the MENU switch to select the INTERFACE position, then use the SCROLL/RESULTS switch to display "INSERT 1020 Hz TONE". Press the INSERT switch (beside the MODE switch). When the LED within the INSERT switch illuminates steadily, adjust the VOL switch until the tone is heard.

(9) With the MENU switch remaining in the INTERFACE position, use the SCROLL/RESULTS switch to display "INSERT BYTE". Press the INSERT switch and verify that the byte displayed in the INTERFACE position of the MENU area is the same as the F SIDE TS#1 result displayed when the 64K RESULTS position is selected. Scroll back to the INTERFACE position and modify the INSERT BYTE using the cursor (left and right arrow) keys and the MODIFY/RESULTS switch. Scroll back to the 64K RESULTS position and verify that the F SIDE TS#1 result is still the byte being inserted.

NOTE: If a VF test set or a BER test set is available, the VF and DATA PORT jacks may be tested in a manner similar to steps 9 and 10. These tests may be performed by selecting the proper interface in the INTERFACE menu and connecting the test set to the appropriate connectors on the INTERCEPTOR.

(10) Press the INSERT switch located in the SIGNALLING area of the INTERCEPTOR front panel. Verify that the A, B, C and D LEDs

under the FROM F label illuminate as the TRANSMIT A, B, C, and D toggle switches are positioned. Change the TRANSMIT toggle switches and verify that the corresponding signalling LEDs change.

When completed, this procedure will have functionally tested the F SIDE of the INTERCEPTOR using the unbalanced inputs.

2.2.4 E Side Unbalanced Jack Test

(1) Disconnect all signal cables connected to the INTERCEPTOR. Connect a cable from the E-SIDE TRANSMIT unbalanced banana jacks to the E-SIDE RECEIVE unbalanced banana jacks.

(2) Press the MENU switch to select the AUXILIARY position.

(3) Press the SCROLL/RESULTS rocker switch (immediately below the left side of the display) until "CLEAR MEMORY" appears in the display. Press the MODIFY/RESULTS rocker switch (below the right side of the display) until "YES" appears in the display. Press the left rocker switch down once so that the message "ARE YOU SURE" appears in the second line of the display. Press the right rocker switch to confirm your intent.

(4) Press the MENU switch to select the F TO E SETUP position. Press the SCROLL/RESULTS switch until "OUTPUT CLOCK": appears in the display. Press the MODIFY/RESULTS switch to select INT (for the internal oscillator). Press the SCROLL/RESULTS switch until "IMPEDANCE" appears in the display. Press the MODIFY/RESULTS switch to select 75 ohm UNBAL.

(5) Press the MENU switch to select the E TO F SETUP position. Press the SCROLL/RESULTS switch until "IMPEDANCE" appears in the display. Press the MODIFY/RESULTS switch to select 75 ohm UNBAL.

(6) Press the RESULTS RESET switch.

RESULT: The INTERCEPTOR is now configured to transmit an HDB3-encoded 2048 kb/s signal from the E SIDE TRANSMIT unbalanced jacks to the E SIDE RECEIVE unbalanced jacks. This signal contains framing, TS-16 multiframing, and CRC multiframing based on the internal 2048 kHz reference oscillator.

E SIDE STATUS signals should now be illuminated as shown below:

		E SIDE STATUS	
O	G	SIGNAL	
O	G	FRAME SYNC	KEY
O	G	MF SYNC	R-RED
	Y	CRC PRESENT	G-GREEN
	Y	HDB3 CODE	Y-YELLOW
O	O	AIS	O-OFF
O	O	TS-16 AIS	
O	O	FAS DISTANT	
O	Y	MFAS DISTANT	
O	O	64KBPS AIS	
_____		HISTORY	

(7) Press the MENU switch to select the 64K RESULTS position. Verify that the displayed E SIDE TS#1 result is 01010100. Press the MENU switch to select the 2048K RESULTS position and verify the following E SIDE results:

FREQUENCY	2048000.0 ±10 Hz
FAS WORD	C0011011
NOT FAS	C1011111
FAS ERRS	0
MFAS ERRS	0
CODE ERRS	0
CRC4 ERRS	0

NOTE: The error counts listed in this procedure are only available when the Results Option is installed.

(8) Press the MODE switch to select drop and insert on the E SIDE. Press the MENU switch to select the INTERFACE position, then use the SCROLL/RESULTS switch to display "INSERT 1020 Hz TONE". Press the INSERT switch (beside the MODE switch). When the LED within the INSERT switch illuminates steadily, adjust the VOL switch until the tone is heard.

(9) With the MENU switch remaining in the INTERFACE position, use the SCROLL/RESULTS switch to display "INSERT BYTE". Press the INSERT switch and verify that the byte displayed in the INTERFACE position of the MENU area is the same as the E SIDE TS#1 result displayed when the 64K RESULTS menu is selected.

Scroll back to the INTERFACE position and modify the INSERT BYTE using the cursor (left and right arrow) keys and the MODIFY/RESULTS switch. Scroll back to the 64K RESULTS position and verify that the E SIDE TS#1 result is still the byte being inserted.

NOTE: If a VF test set or a BER test set is available, the VF and DATA PORT jacks may be tested in a manner similar to steps 9 and 10. These tests may be performed by selecting the proper interface in the INTERFACE menu and connecting the test set to the appropriate connectors on the INTERCEPTOR.

(10) Press the INSERT switch located in the SIGNALLING area of the INTERCEPTOR front panel. Verify that the A, B, C and D LEDs under the FROM E label illuminate as the TRANSMIT A, B, C, and D toggle switches are positioned. Change the TRANSMIT toggle switches and verify that the corresponding signalling LEDs change.

When completed, this procedure will have functionally tested the E SIDE of the INTERCEPTOR using the unbalanced inputs.

INSTRUMENT DESCRIPTION

3.1 INTRODUCTION

This section describes the INTERCEPTOR 264's front-panel switches, indicators, menu functions, keypad, and displays. It also describes the connectors and test points on the side panel, as well as other pertinent features.

3.2 FRONT PANEL CONTROLS, INDICATORS, AND CONNECTORS

Figure 3-1 identifies the discrete switches, indicators, and connectors on the INTERCEPTOR front panel. The numbers in the figure correspond to the descriptions which follow.

1. E SIDE STATUS LEDs

E SIDE STATUS LEDs report on the status of the E SIDE receive input. Red LEDs indicate an alarm condition, green LEDs indicate the presence of a proper signal or synchronization condition, and yellow LEDs indicate general status. Additionally, HISTORY LEDs indicate the previous occurrence of alarm or status. The HISTORY LEDs (as well as results) can be reset by pressing the RESULTS RESET switch located on the right side of the front panel.

The function of each E SIDE STATUS indicator is described in the following list. Note that an identical set of status LEDs is available for the F SIDE receive input.

SIGNAL

RED - Loss of signal or signal level too low to recover.
GREEN - Valid signal present.
HISTORY RED - Signal was lost since last reset.

FRAME SYNC

OFF - Frame synchronization not present since power-up or reset.
RED - Loss of frame synchronization.
GREEN - Frame synchronization present.
HISTORY RED - Frame synchronization loss has previously occurred.

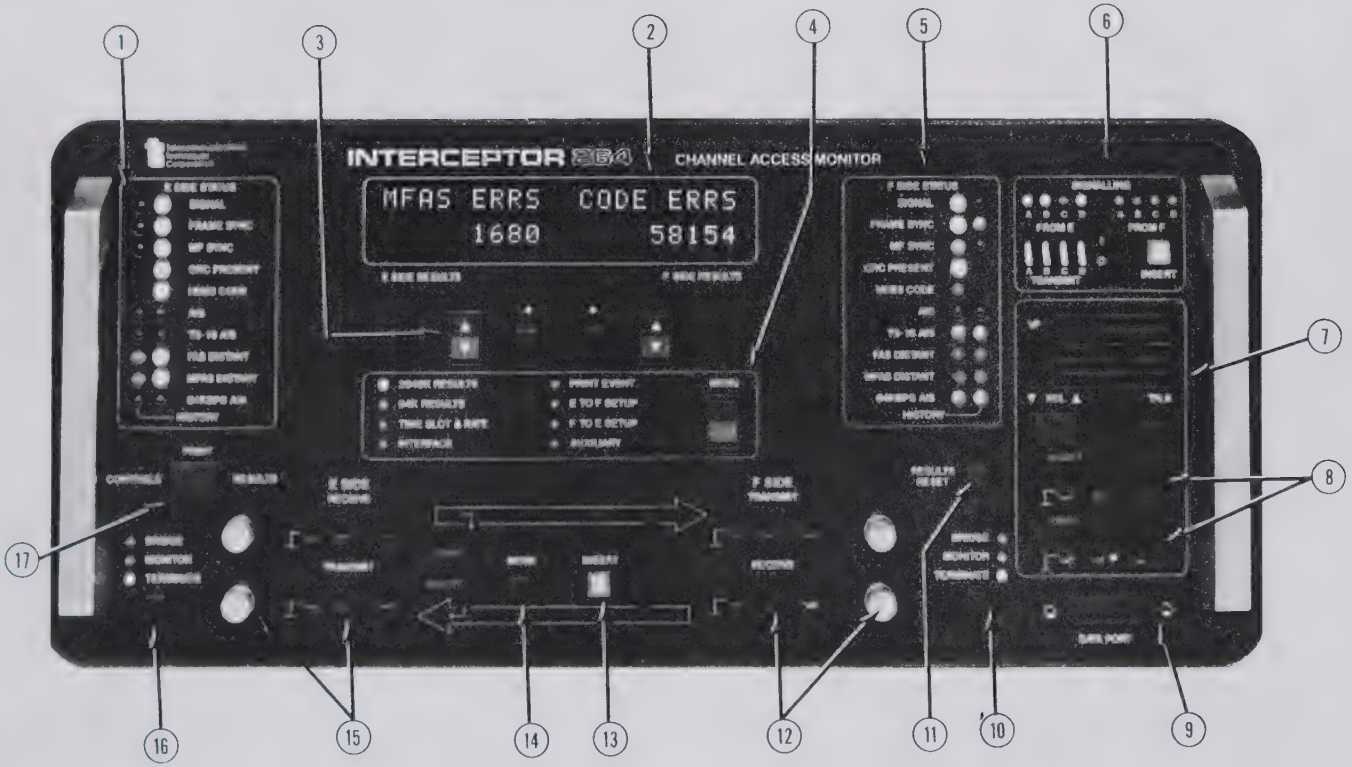

Figure 3-1
INTERCEPTOR 264 Front Panel

MF SYNC (multiframe synchronization)

OFF - Multiframe synchronization not present since power-up or reset.
RED - Loss of multiframe synchronization.
GREEN - Multiframe synchronization present.
HISTORY RED - Multiframe synchronization loss has previously occurred.

CRC PRESENT (cyclic redundancy check)

OFF - CRC-4 framing not present.
YELLOW - CRC-4 framing and codes present.

HDB3 CODE (High density bipolar three)

OFF - No HDB3 coding present on the received signal.
YELLOW - HDB3 coding is detected.

AIS (Alarm Indication signal)

OFF - AIS is not being received.
RED - AIS is being received.
HISTORY RED - AIS was previously received.

TS-16 AIS (Time Slot 16 Alarm Indication Signal)

OFF - TS16 AIS is not being received.
RED - AIS is being received in timeslot 16.
HISTORY RED - AIS was previously received in timeslot 16.

FAS DISTANT (Frame Alignment Signal Distant)

OFF - No alarm indication.
YELLOW - Frame Alignment Signal loss at transmitting station.
HISTORY YELLOW - FAS Distant Alarm was previously received.

MFAS DISTANT (Multiframe Alignment Signal Distant)

OFF - No alarm indication.
YELLOW - Multiframe Alignment Signal loss at transmitting station.
HISTORY YELLOW - MFAS Distant Alarm was previously received.

64 KBPS AIS (64 kb/s alarm indicating signal)

OFF - AIS is not present in the timeslot selected.
RED - The timeslot selected for **all ones** monitoring contains all ones.
HISTORY RED - The timeslot selected for **all ones** monitoring previously received all ones.

2. RESULTS AND MENU DISPLAY

This two-line, 20-character vacuum fluorescent display shows results and menu selection parameters. When results are displayed, results from the E Side input signal are presented in the left half of the display; results from the F Side input signal are presented in the right half of the display. The right and left section of the display are identical in function. The upper line of each section provides the result name, while the lower line contains the result itself. If a result is not available (e.g., when the INTERCEPTOR is not yet synchronized to incoming data), the lower line of the display remains blank. The user may scroll through the various results using the display control switches below the display.

3. DISPLAY CONTROL SWITCHES

The four DISPLAY CONTROL switches configure menu parameters and access results. The left rocker (SCROLL/RESULTS) switch allows menu selection, while the right rocker (MODIFY/RESULTS) switch modifies menu parameters. The two pushbutton switches control movement for menus which feature a cursor.

4. MENU SWITCH

The MENU rocker switch selects the main menus to be presented in the display. Pressing the switch in either direction scrolls through the menus in that direction. A menu is selected when the LED adjacent to the menu label is illuminated. Each main menu is described in detail in Section 3.4.

5. F SIDE STATUS

The F SIDE STATUS LEDs are identical in function to the E SIDE STATUS LEDs described previously.

6. SIGNALLING LEDS AND SWITCHES

The A, B, C, and D LEDs indicate the status of the signalling bits for the selected channel (FROM E or FROM F). The bits transmitted may be set using the four white switches. The insertion of signalling bits is initiated by pressing the INSERT pushbutton switch. There is an LED within the

INSERT switch that begins flashing when the switch is pressed. When the LED stops flashing and is continuously illuminated, insertion of signalling bits begins.

7. SPEAKER INTERFACE AND SWITCHES

A speaker permits the monitoring of speech or tone. It also functions as a microphone when the TALK switch is pressed. Speaker volume may be adjusted up or down by pressing the VOL switch to the appropriate position.

8. VF JACKS

The INTERCEPTOR's two VF jacks are balanced, 3-pin banana jacks. The operation of these jacks is keyed to the current setting of the MODE switch (located in the lower center of the front panel). When either DROP & INSERT E or DROP & INSERT F is the current MODE switch selection, the top jack is used to input VF signals for insertion into the 2048 kb/s data stream; the lower jack drops the VF signal from the other 2048 kb/s data stream. When DROP E and F is the current MODE switch selection, the top jack provides the VF signal demultiplexed from the E side 2048 kb/s input; the lower jack provides a VF signal demultiplexed from the F side 2048 kb/s input.

9. DATA PORT

This is a 15-pin D subminiature connector. The electrical interface at this jack is designed to ISO-4903 standards. It provides access to clock and data of N x 64 kb/s channels and is used for full-duplex monitoring as well as drop and insert of N x 64 kb/s data.

10. F-SIDE LINE INTERFACE SELECTION

This pushbutton switch allows the user to select one of three available line interfaces available: BRIDGE, MONITOR, or TERMINATE. BRIDGE provides an input impedance greater than 1000 ohms for monitoring lines that are already terminated. MONITOR provides a 120-ohm input impedance for balanced interfaces and a 75-ohm input impedance for unbalanced interfaces, as well as amplification of the input signal. TERMINATE provides 120 ohms of input impedance for balanced interfaces, and 75 ohms for unbalanced

interfaces. A selection is made when the adjacent LED is illuminated. This selection controls both the balanced and unbalanced input for the F SIDE INPUT.

11. RESULTS RESET

Pressing this pushbutton switch resets all results counts and clears the E SIDE and F SIDE STATUS HISTORY LEDs.

12. F SIDE 2048 KBPS JACKS

These connectors act as an interface to the 2048 kb/s signals associated with the F side of the instrument. Two banana jacks are provided for 120-ohm balanced interfaces, and two BNC connectors are provided for 75-ohm unbalanced interfaces with either BNC or 1.6 - 5.6 plugs. The balanced interface operates with HDB3 or AMI line coding; the unbalanced interface operates with HDB3, AMI, RZ, and NRZ coding.

13. INSERT SWITCH

Pressing the INSERT switch initiates the insertion of data or VF from the selected interface or the INTERCEPTOR internally. An LED within the switch flashes until insertion actually begins, after which the LED is continuously illuminated.

14. MODE SWITCH

The MODE switch selects how timeslots are accessed in the two 2048 kb/s frames. Pressing the MODE switch allows the user to scroll through and select from the following:

DROP and INSERT E
DROP and INSERT F
DROP E and DROP F

15. E SIDE 2048 KBPS JACKS

The E Side 2048 kb/s jacks are identical to the F Side 2048 kb/s jacks described previously.

16. E-SIDE LINE INTERFACE SELECTION

The BRIDGE, MONITOR, and TERMINATE selections are identical to the F SIDE line interface selections described previously.

17. PRINT CONTROLS/RESULTS SWITCH

This rocker switch selects either results or controls printouts. Setting the switch to the RESULTS position initiates a printout of all status indicators and test results. Setting the switch to the CONTROLS position initiates a printout of the current instrument set-up.

3.3 SIDE PANEL

The right side panel of the INTERCEPTOR provides access to connectors and switches that are less frequently used. Interfaces to option boards (such as the IEC-625 remote control option) are located on the side panel. Figure 3-2 shows the INTERCEPTOR side panel. The numbers in the figure correspond to the numbered descriptions which follow.

1. E TO F TEST POINTS

This connector provides access to several signals which may be useful in advanced applications. Twenty signals are provided as follows:

RX DATA	2048 kb/s received data.
RX CLOCK	Clock recovered from the E SIDE received data or used to input received data.
TX DATA	2048 kbps F SIDE transmit data stream.
TX CLOCK	Clock used to transmit the 2048 kb/s data.
CRC ERR	Pulses when a CRC error is detected on a subframe. (E SIDE INPUT)
RED ALARM	High-level output when framing is lost on E SIDE received signal.
FRM SYNC	This bit goes high indicating the presence of an FAS in a framed data stream or an FAS in frame 0 of a 16 frame multiframed voice and data stream.
FRM ERR	Pulses when an error occurs on the E SIDE received frame alignment word.

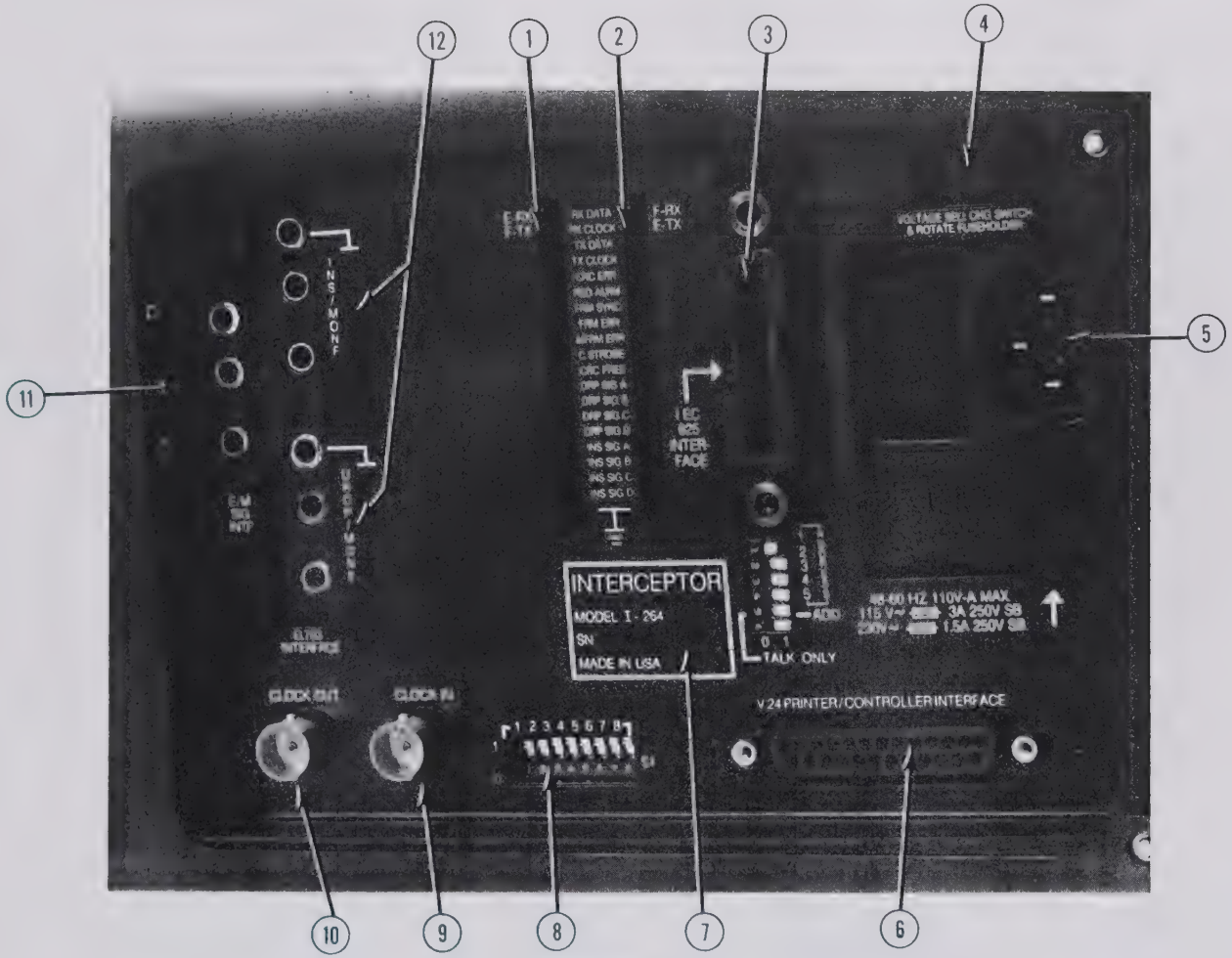

Figure 3-2
INTERCEPTOR 264 Side Panel

MFRM ERR	Pulses when an error occurs on the E SIDE received multiframe alignment word.
C STROBE	This bit goes high on every timeslot 0 of the 32 timeslot frame.
CRC PRES	When this line is high it indicates the instrument is correctly receiving the CRC multiframe alignment bits. (E SIDE INPUT.)
DRP SIG A	This bit represents the "A" signalling bit for the first timeslot selected for monitoring or dropping. (E SIDE INPUT.)
DRP SIG B	This bit represents the "B" signalling bit for the first timeslot selected for monitoring or dropping. (E SIDE INPUT).
DRP SIG C	This bit represents the "C" signalling bit for the first timeslot selected for monitoring or dropping. (E SIDE INPUT.)
DRP SIG D	This bit represents the "D" signalling bit for the first timeslot selected for monitoring or dropping. (E SIDE INPUT.)
INS SIG A	Reserved for future use.
INS SIG B	Reserved for future use.
INS SIG C	Reserved for future use.
INS SIG D	Reserved for future use.
Ground	Signal Ground.

2. F TO E TEST POINT

The test points for the F to E direction are identical in function to the E to F direction test points just described.

3. IEC-625 (IEEE-488) INTERFACE

The IEC-625 (IEEE-488) interface allows the INTERCEPTOR to be operated by remote control. A standard connector is provided for the electrical interface. The address for this device on the IEC-625 bus is selected using the DIP switch above the connector. Connecting the INTERCEPTOR to an IEC-625 printer is possible by setting the DIP switch labeled TALK ONLY/ADD. (addressable) to the TALK ONLY position.

4. VOLTAGE SELECTION SWITCH

This red switch should be adjusted to select the desired operating voltage. The selections are:

115V : 90 - 135 VAC, 50-60 Hz
230V : 195 - 250 VAC, 50-60 Hz

CAUTION: Be sure that the fuseholder is rotated so that the arrow points to the same voltage selection made with this switch. Always use the proper fuse type and size for the voltage selected.

5. POWER SWITCH, RECEPTACLE, AND FUSEHOLDER

This is the line power module for the instrument, and contains the main power switch, power receptacle, and fuseholder. The fuseholder slides out with the aid of a small screwdriver, allowing the user to replace fuses or rotate the fuseholder 180° to select between two voltages. Proper fuse sizes and types are listed on the side panel beneath the line power module.

CAUTION: Always replace fuses with the same size and type as the fuse which was removed. Note that the two fuses in the fuseholder are different! Damage may result from using fuse sizes and types other than those recommended on the side panel of the instrument.

CAUTION: Be sure that the red voltage selection switch is positioned correctly to correspond to the fuse selection. There is a small arrow on the line power module which points to the voltage indication on the fuseholder. The voltage selection switch position must always match the fuseholder voltage selection. Damage to the instrument may result from improper voltage selections.

6. V.24 (RS-232) PRINTER/CONTROLLER INTERFACE

The V.24 (RS-232) Printer/Remote Control interface is a standard 25-pin "D" type connector. A standard ASCII printer or V.24 controlling device may be connected directly.

7. IDENTIFICATION LABEL

This identification label contains the manufacturer's name, instrument model and serial numbers, and country of origin. The model and serial numbers should be quoted on any correspondence with the factory concerning the instrument.

8. S1 SWITCH

The S1 DIP switches are reserved for future use.

9. "CLOCK IN" BNC CONNECTOR

An external clock may be used to transmit 2048 kb/s information from the INTERCEPTOR using the "CLOCK IN" BNC connector. This connector is also used to input the receive clock for the receive data when NRZ operation is selected with external clock.

10. "CLOCK OUT" BNC CONNECTOR

This buffered, TTL-level clock is used as bit reference for received and transmitted data. During recovered mode this clock receives the extracted E or F side 2048 kb/s clocks. The CLOCK OUT connector also synchronizes NRZ data coming from the INTERCEPTOR during NRZ operation (using internal clock mode).

11. E&M SIGNALLING CONNECTOR

The E&M signalling connector is a three-pin banana jack whose operation is keyed to the current setting of the MODE switch. When either DROP and INSERT E or DROP and INSERT F mode is selected, the bottom pin (M-lead) is an input which monitors an E&M signalling line for insertion on time slot 16 of the 2048 kb/s data stream; the middle pin (E-lead) outputs the signalling information for the timeslot being monitored. When DROP E and DROP F mode is selected, the middle pin (E-lead) outputs signalling information for the timeslot being monitored on the E-side 2048 kb/s data stream; the bottom pin (M-lead) outputs signalling information for the F side. The top pin of the connector is tied to system ground.

12. 64 kb/s G.703 CONNECTORS

The 64 kb/s G.703 connectors are two 3-pin, 120-ohm, balanced banana jacks. Like the E&M signalling connector, their operation is keyed to the current setting of the MODE switch. When either DROP and INSERT E or DROP and INSERT F mode is selected, the top jack receives a 64 kb/s codirectional G.703 signal that is inserted into the 2048 kb/s data stream; the bottom jack outputs the 64 kb/s timeslot to be dropped as a 64 kb/s codirectional G.703 data stream. When DROP E and DROP F mode is selected, the top jack outputs the timeslot being monitored on the F side 2048 kb/s data stream; the bottom jack outputs the timeslot being monitored on the E side 2048 kb/s data stream.

3.4 MENU FUNCTIONS

As described in Section 3.2, the MENU switch allows the user to select main menus that either (1) select results to be displayed, or (2) set up specific functions on the INTERCEPTOR.

3.4.1 Results Menus

Two menu selections — 2048K RESULTS and 64K RESULTS — are results categories. The results available in each category are described in the following paragraphs.

2048K RESULTS

The following results are available in the 2048K RESULTS category. See Figure 3-3 for a diagram of the 2048K RESULTS menu.

FREQUENCY	Displays the received frequency with a resolution of 0.1 Hz.
FAS WORD	Displays the frame alignment signal word received in timeslot zero. An X identifies any bit in error over the last second; a C in the first bit indicates that CRC4 has been detected.

NOT FAS	Displays the not frame alignment signal word received in alternate timeslot zeros. This includes national and international bits. A C in the first bit indicates that CRC4 has been detected.

The following 2048K RESULTS category error rates and counts are available when the Results option (Option 001) is installed.

FAS ERRS	Displays the number of frame alignment signal words received in error while the INTERCEPTOR is in frame sync.
MFAS ERRS	Displays the number of multiframe alignment signal words received in error while the INTERCEPTOR is in TS-16 multiframe sync.
CODE ERRS	Displays the number of HDB3 or AMI code errors received.
CRC 4 ERRS	Displays the number of cyclic redundancy check errors received while in CRC multiframe alignment.
FAS RATE	Displays the number of frame alignment signal word errors received divided by the quantity of frames received.
MFAS RATE	Displays the number of multiframe alignment signal word errors received divided by the quantity of TS-16 multiframes received.
CRC4 RATE	Displays the number of cyclic redundancy check (CRC) errors received divided by the number of CRC-4 multiframes received.
CODE RATE	Displays the number of code errors received divided by the number of bits received. Code errors are HDB3 errors when HDB3 coding is selected, and AMI errors when AMI coding is selected. The result has no meaning for RZ and NRZ coding formats.

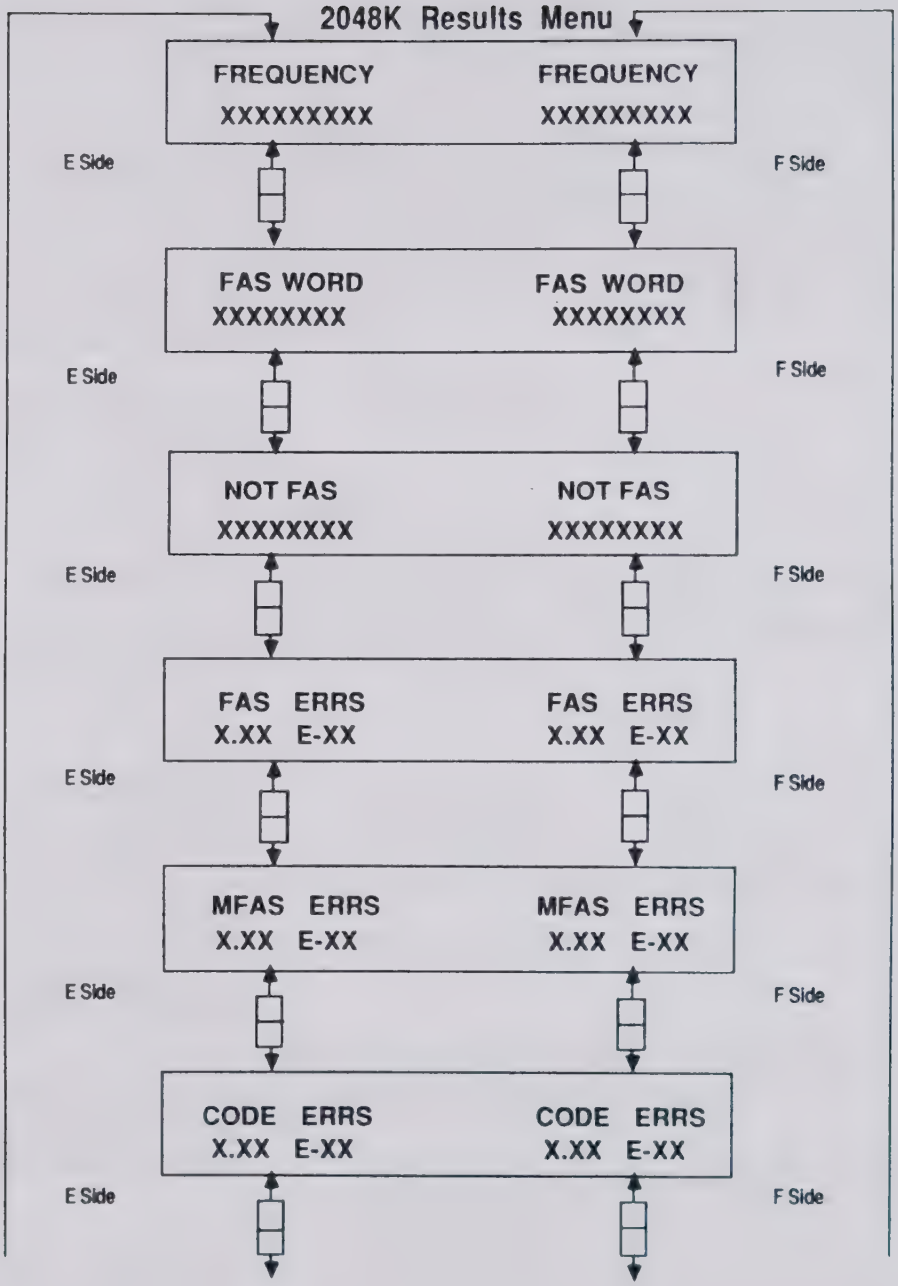

Figure 3-3
2048K RESULTS Menu

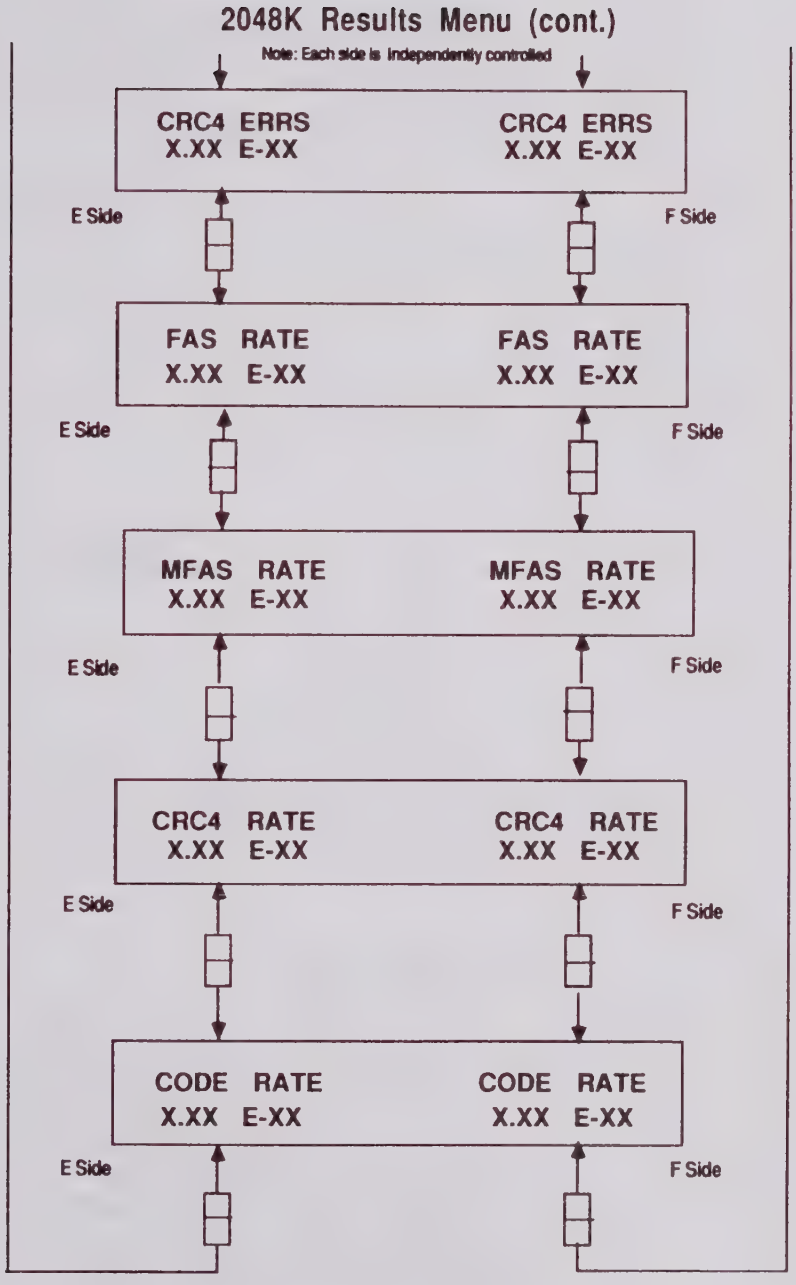

Figure 3-3
2048K RESULTS Menu (Cont.)

64K RESULTS

The 64K RESULTS menu displays the byte received in the timeslot selected in the TIMESLOT & RATE menu. If multiple timeslots are selected (i.e. NX64, N>1), the received byte for the timeslot with the lowest numerical value selected is displayed. Figure 3-4 shows the 64K RESULTS menu.

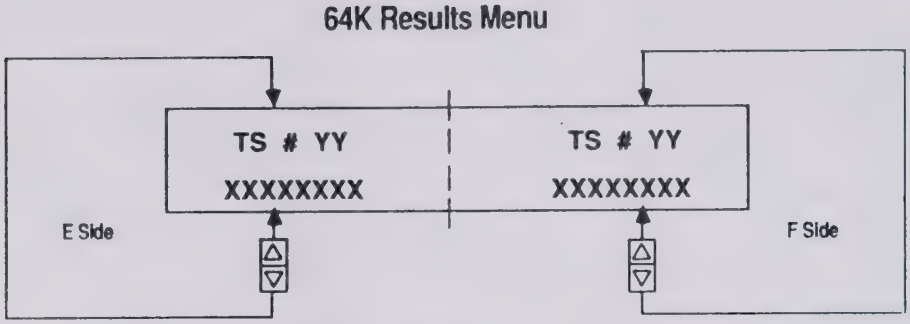

Figure 3-4
64K RESULTS Menu

3.4.2 Set-Up Menus

The remaining selections of the MENU switch enable the user to configure parameters for particular interfaces and applications. These menus are described in the following paragraphs.

TIMESLOT & RATE

This menu selects the data rate and the timeslots to be dropped or inserted. (See Figure 3-5 for a diagram of the TIMESLOT & RATE menu). There are separate menus for selecting dropped and inserted timeslots for both the E and F directions, as well as the aggregate data rate being accessed. Timeslots to be accessed are selected by scrolling the cursor using the and arrow keys to the desired timeslot and pressing the right (MODIFY/RESULT) rocker switch. **The number of selections (arrows) made in each menu must be identical to the number of timeslots selected in the data rate selection.** This means that, for example, if a data rate of 448 kb/s (7 x 64 kb/s, is chosen, 7 arrows should be present in both Drop and both Insert menus.

NOTE: The asterisk shown at Timeslot 16 in Figure 3-5 indicates that MFAS is selected and Timeslot 16 is unavailable for data insertion.

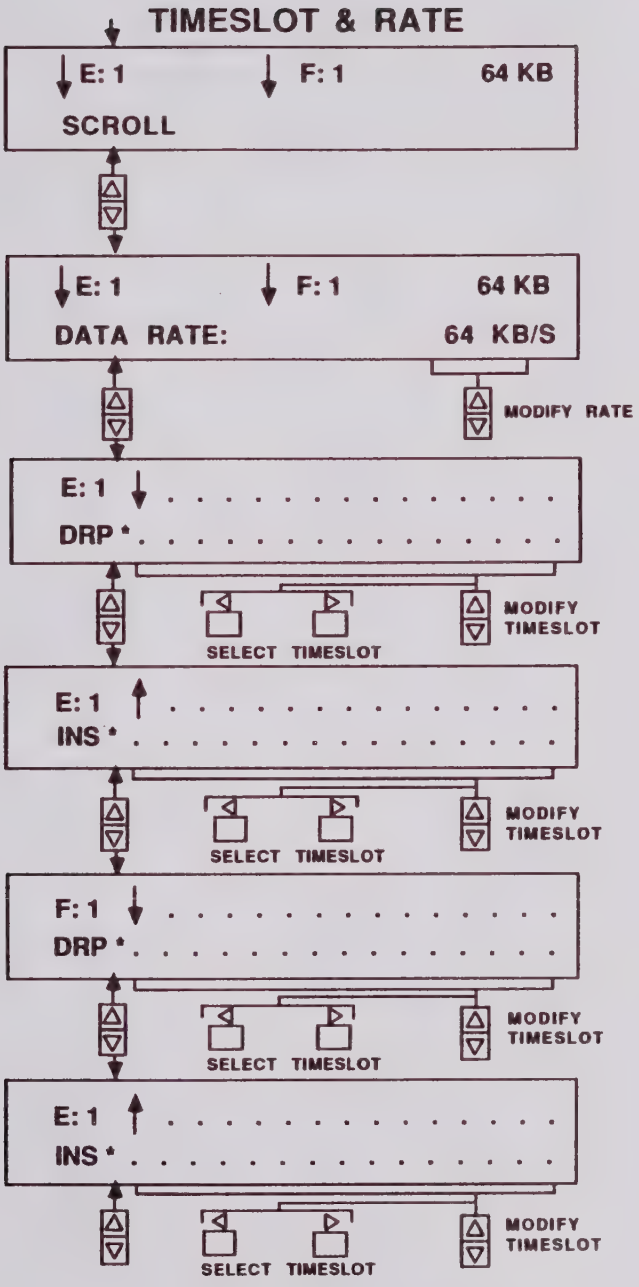

Figure 3-5
TIMESLOT & RATE Menu

INTERFACE

This menu allows the user to select the interface for drop and insert access. Figure 3-6 shows a diagram of the INTERFACE menu. The selections are described in the following list.

DATA PORT	This selection allows data to be dropped or inserted on the 15-pin D subminiature Data Port located on the front panel.
VF	This selection allows voice frequency signal to be monitored and inserted on the two3-pin banana jacks located on the front panel as well as the speaker/microphone.
INSERT 1020 Hz TONE	This selection transmits a 1020 Hz tone at 0 dBm on all channels selected for insertion.
INSERT BYTE	This selection transmits the user-entered byte on all channels selected for insertion. The byte is modified one bit at a time. To alter the byte transmitted: (1) Move the cursor to the desired bit by pressing the left or right cursor switch. (2) Press the right (MODIFY/RESULTS) rocker switch to select either zero or one. The data bits are displayed with the least significant on the left.
G.703	This selection transmits the data received by G.703 interface into all timeslots selected for insertion. To change the input impedance of the G.703 interface, press the MODIFY/RESULTS to select BRIDGE (>1000 ohms) or TERMINATE (120 ohms) modes. Note that this selection only appears when the G.703 option is installed.

PRINT EVENT

This menu allows the user to select the interval for printing results; it also controls whether error, status, and signalling events are printed. This menu

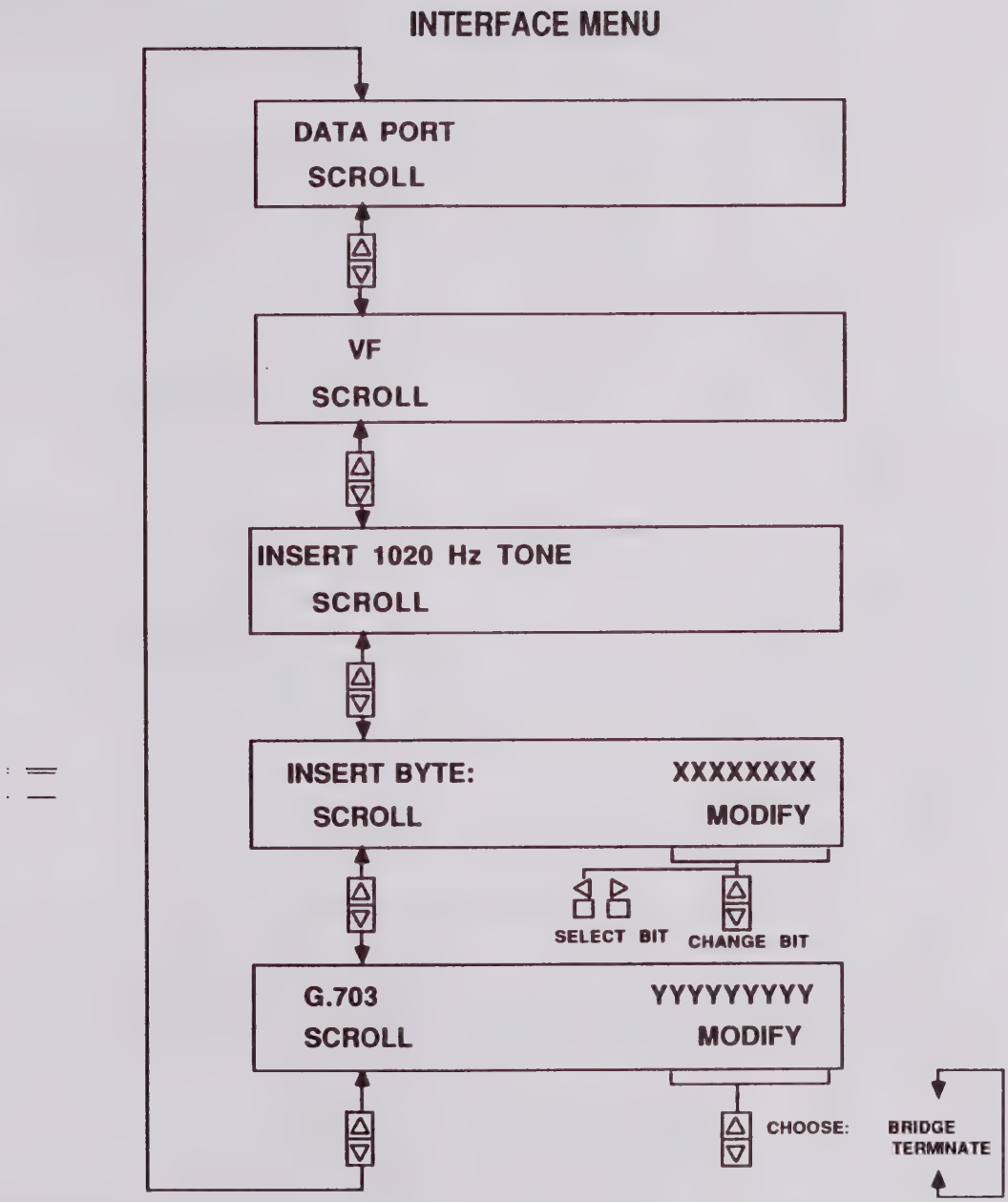

Figure 3-6
INTERFACE Menu

is present only if the V.24 option (Option 002) is installed. The configurable parameters appear on the bottom line of the display, while the selection that the user has made appears on the top line. Figure 3-7 is a diagram of the PRINT EVENT menu. The selections are described in the following list.

ERROR EVENT	This selection may be toggled either ON or OFF. Selecting ON causes a printout to be generated automatically on the occurrence of an error. If multiple errors occur in a second, only one printout is provided.
SIGNALLING EVENT	This selection may be toggled either ON or OFF. Selecting ON causes a printout to be generated automatically as a result of signalling changes.
SIGNALLING SUMMARY	This selection allows the user to initiate a SIGNALLING SUMMARY printout for the selected channel. The last 100 signalling events received will be printed. Pressing the MODIFY/RESULTS switch down initiates the printout.

SETUP E TO F / SETUP F TO E

The SETUP E TO F and F TO E menus configure each set of the INTERCEPTOR's 2048 kb/s data inputs and outputs for the signal it is receiving. Parameters may be set for framing, signal format, output clock, line buildout, and input impedance. Selections made for each direction are independent of the other. Figure 3-8 shows a diagram of the SETUP menus.

FRAMING

FAS	The 2048 kb/s interface selected is configured for the frame alignment signal message in timeslot zero.
FAS-CRC	In addition to the frame alignment signal, the interface selected is configured for CRC-4 framing and error checking.

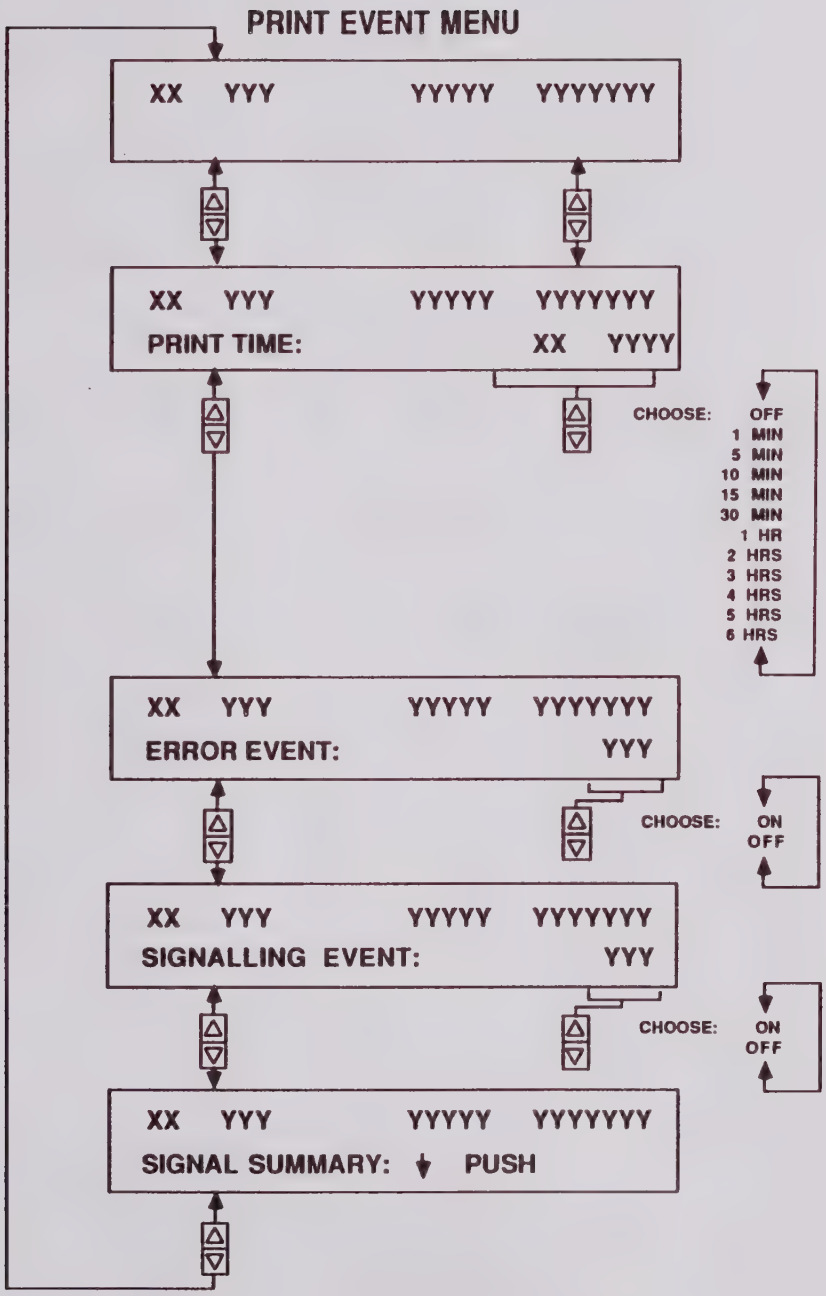

Figure 3-7
PRINT EVENT Menu

MFAS — In addition to the frame alignment signal, the interface selected is configured for the multiframe alignment signal in timeslot 16 of every sixteenth frame.

MFAS-CRC — In addition to the frame alignment signal and multiframe alignment signal, the interface selected is configured for CRC-4 framing and error checking.

SIGNAL FORMAT

HDB3 — Signal is received and transmitted with High Density Bipolar 3 (HDB3) coding.

AMI — Signal is received and transmitted with Alternate Mark Inversion (AMI) coding.

NRZ — Signal is received and transmitted with Non Return to Zero (NRZ) encoding. This signal format requires the use of the unbalanced (75 ohm) connectors. Receiving NRZ data requires the use of an external clock at the CLOCK IN connector on the side panel.

RZ — Signal is received and transmitted with Return to Zero (RZ) encoding. This signal format requires the use of the unbalanced (75 ohm) connectors.

OUTPUT CLOCK

RECOVERED — Data is transmitted using the clock recovered from the input data stream.

EXTERNAL — Data is transmitted with timing provided at the INPUT CLOCK connector located on the side panel. Data is also received with this clock when NRZ signal format is selected. When NRZ is selected, OUTPUT CLOCK must be sent to EXT.

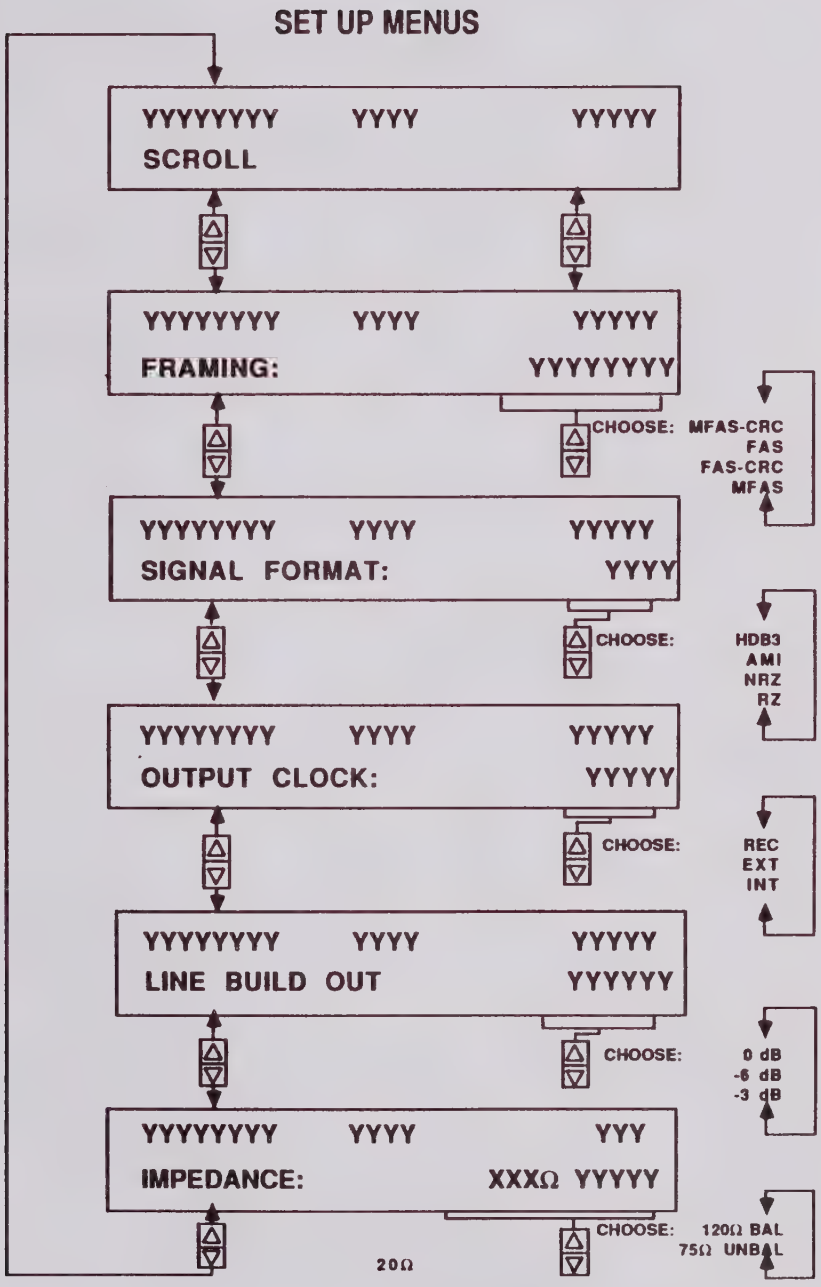

Figure 3-8
SETUP Menus

INTERNAL	Transmitted data is synchronized with the internal reference clock. This selection is usually made when the INTERCEPTOR is used as a transmit-only device.

LINE BUILD OUT

0 dB	The balanced output at the 120-ohm connector is not attenuated from nominal levels.
-6 dB	The balanced output at the 120-ohm connector is attenuated by 6 dB using a first order approximation to 24 gauge cable.
-3 dB	The balanced output at the 120-ohm connector is attenuated by 3 dB using a first order approximation to 24 gauge cable.

IMPEDANCE

120 OHM **BAL**	This selects the 3-pin banana jack for input and is used for balanced AMI or balanced HDB3. Both the balanced and unbalanced output connectors remain active.
75 OHM **UNBAL**	This selects the coaxial jack for input and is used for unbalanced AMI, unbalanced HDB3, RZ, or NRZ. This mode must be selected for RZ or NRZ. Both the balanced and unbalanced output connectors remain active when AMI and HDB3 signal formats are selected. Only the unbalanced output is active when RZ or NRZ signal formats are selected.

AUXILIARY

The AUXILIARY menu is used to configure miscellaneous system operating parameters. Not all of the Auxiliary functions listed in this section will appear in the menu unless all options are installed. Figure 3-9 shows a diagram of the AUXILIARY menu.

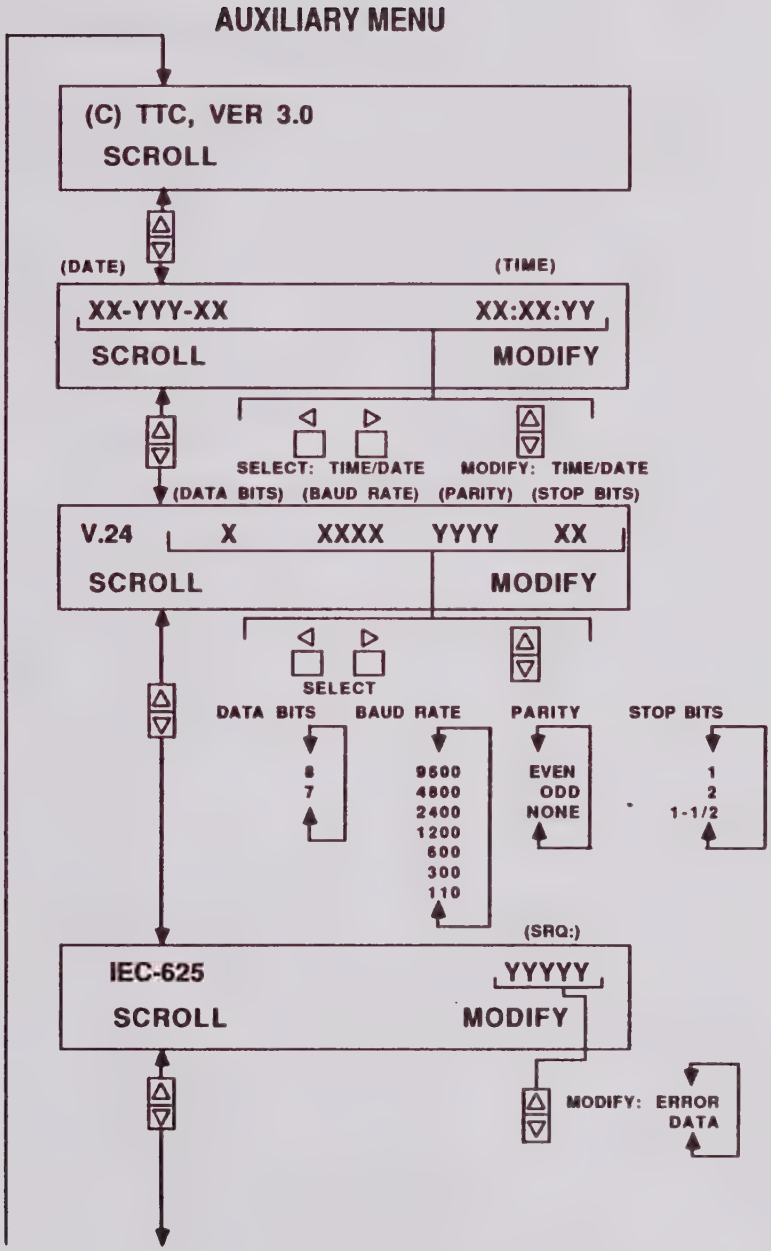

Figure 3-9
AUXILIARY Menu

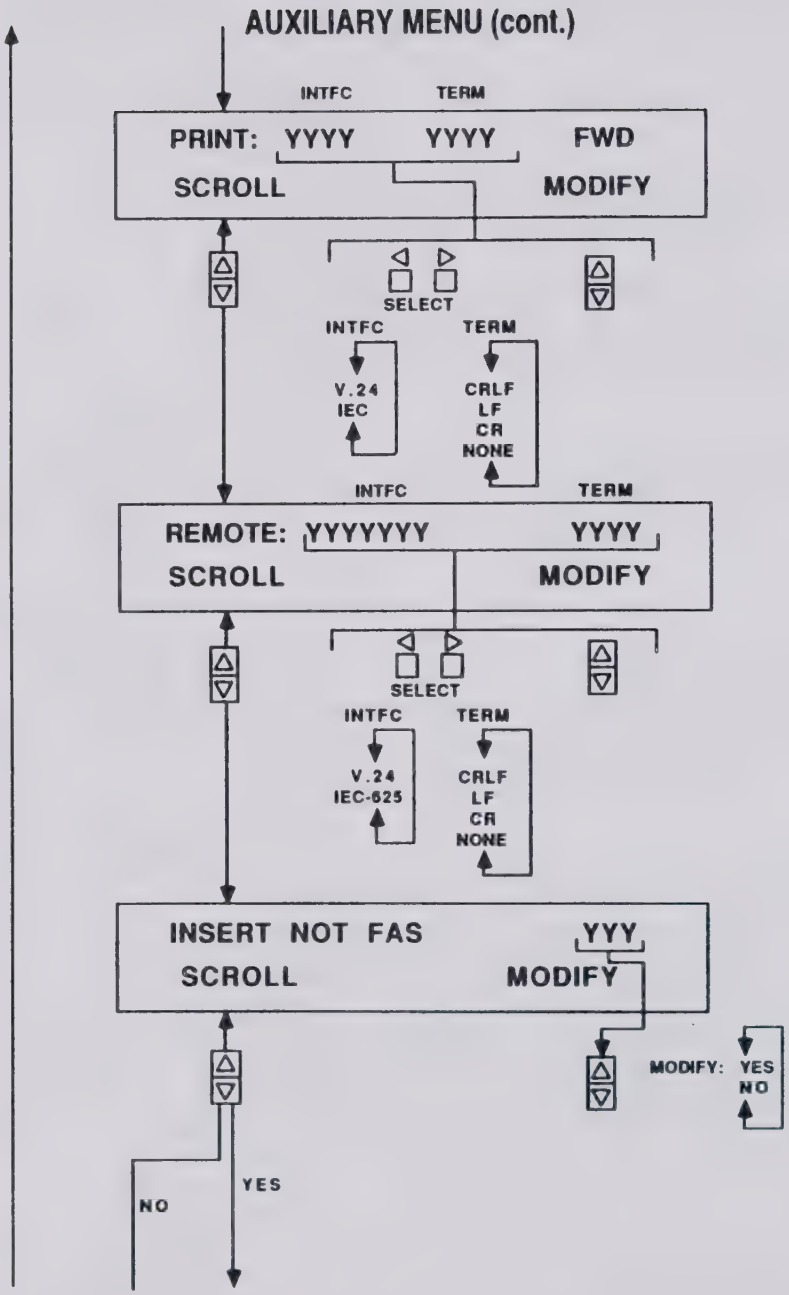

Figure 3-9
AUXILIARY Menu (Cont.)

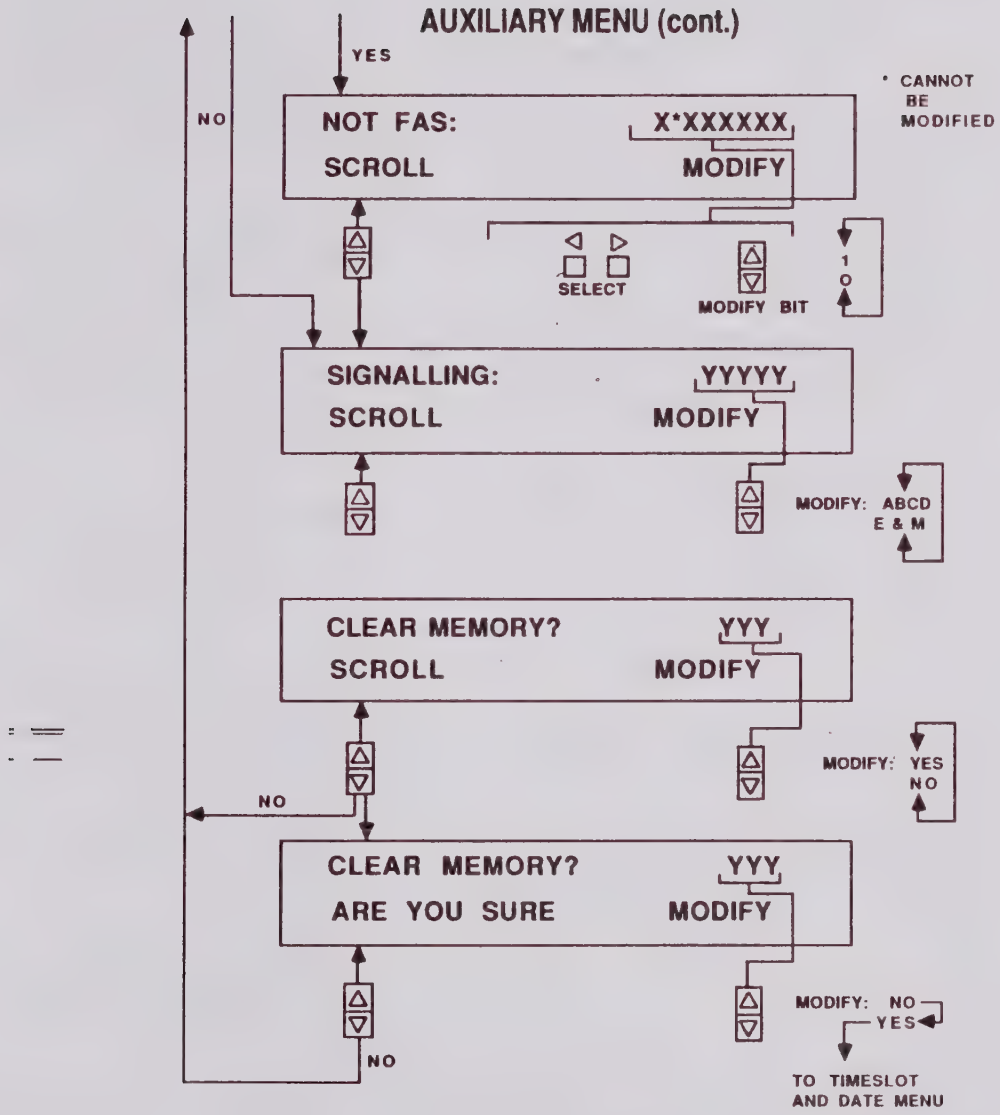

Figure 3-9
AUXILIARY Menu (Cont.)

SOFTWARE VERSION	This displays the copyright message and current software version. No user selections are available.
DATE and TIME	The date and time of the real-time clock are set by using the left and right arrow switches to select a parameter and the MODIFY/RESULTS switch to scroll to the desired setting.
V.24	This display is used to configure the optional V.24 port. The number of data bits, baud rate, parity, and number of stop bits are set by using the left and right arrow switches to select a parameter and the MODIFY/RESULTS switch to scroll to the desired setting. **NOTE:** This display will not appear if the V.24 Printer/Remote Control option is not installed.
IEC-625	This display is used to configure the type of Service Request set by the IEC-625 (IEEE-488) interface. The MODIFY/RESULTS switch can be used to generate a Service Request when data is available or an error condition is detected, or solely on the detection of an error condition. **NOTE:** This display will not appear if the IEC-625 Printer/Remote Control option is not installed.
PRINT	This display is used to select which interface will control the external printer and the termination character for the external printer. The user can choose the type of printer and the termination character by using the left and right arrow switches to select a parameter and the MODIFY/RESULTS switch to scroll to the desired setting.

NOTE: This display will not appear if the V.24 and IEC-625 options are not installed. If only one option is installed, this display will only allow the user to change the termination character.

REMOTE

This display is used to select which interface will be used for remote control of the INTERCEPTOR and the termination character for the remote interface. The user can choose the remote control interface and termination character by using the left and right arrow switches to select a parameter and the MODIFY/RESULTS switch to scroll to the desired setting.

NOTE: This display will not appear if the V.24 and IEC-625 options are not installed. If only one option is installed, this display will only allow the user to change the termination character.

INSERT NOT FAS

This display is used to toggle on and off the transmission of the NOT FAS word in timeslot 0 when the timeslot INSERT switch is illuminated. The NOT FAS word contains the national and international bits and the remote alarm bit.

NOT FAS

This display is used to modify the NOT FAS word which will be inserted in timeslot 0. The NOT FAS word is modified by using the left and right arrow keys to move the cursor to the bit desired and pressing the MODIFY/RESULTS switch to modify the bit. This display will only appear if the INSERT NOT FAS function is set to YES. The NOT FAS word will only be inserted when the timeslot INSERT switch is illuminated.

SIGNALLING

This display selects the interface used to insert channel-associated signalling. ABCD selects the signalling switches on the front panel of the INTERCEPTOR as the source of the signalling information for the selected timeslots. E & M selects the E & M signalling interface as the source for the timeslot signalling information. To switch signalling sources, toggle the MODIFY/RESULTS switch to either ABCD or E & M.

NOTE: This display appears only when the E & M option is installed. When not installed, the INTERCEPTOR defaults to ABCD signalling.

CLEAR MEMORY

This display is used to clear non-volatile RAM and return the instrument to default (factory) parameters.

OPERATING INSTRUCTIONS

4.1 INTRODUCTION

This section offers detailed operating instructions for using the test capabilities of the INTERCEPTOR 264. Note that Section 2 of this manual (Preparation for Use) should be read before performing any of the operating procedures described herein. Additionally, familiarity with Section 3 will permit better understanding of these procedures and aid in interpreting the results provided by the instrument.

4.2 OPERATING PROCEDURES

The following sections describe the operation of the INTERCEPTOR as (1) a full-duplex, G.704 2048 kb/s circuit monitor (2) a timeslot monitor (3) a timeslot access drop and insert.

NOTE: A portion of the menu display may blink while performing any of the following procedures. In such instances, an invalid selection has been made. Invalid selections can be corrected by changing the affected parameter selection. In most cases, the flashing display **must** be corrected before continuing to another level of the menu.

4.2.1 Operation as a Full-Duplex, G.704 2048 kb/s Circuit Monitor

The INTERCEPTOR can be used as a full-duplex 2048 kb/s, circuit monitor for status, alarms, and errors. In this application, the INTERCEPTOR is transparent to the 2048 kb/s stream. Monitoring mode is the default mode of the unit at power-up. The E (Equipment) SIDE STATUS and F (Facility) SIDE STATUS LEDs monitor the two independent 2048 kb/s inputs simultaneously.

Set-Up

To monitor a full-duplex 2048 kb/s circuit, use the following step-by-step procedure.

NOTE: This procedure is intended as a guide; it is not the only available operating sequence.

(1) Check the side panel to ensure that the AC voltage is set properly and that the fuseholder is in the proper position (115 VAC or 230 VAC). Connect power to the INTERCEPTOR and set the side-panel POWER switch to the ON position.

(2) Use the MENU switch to select the E TO F SETUP menu. The E TO F SETUP refers to the PCM stream that enters the INTERCEPTOR on the left (E) side and is transmitted out on the right (F) side. Use the Scroll/Results switch and the Modify/Results switch to select the desired FRAMING, SIGNAL FORMAT, OUTPUT CLOCK (choose RECovered), LINE BUILDOUT, AND IMPEDANCE.

(3) Use the MENU switch to select the F TO E SETUP menu. The F TO E SETUP refers to the PCM stream that enters the INTERCEPTOR on the right side and is transmitted out on the left side. Use the SCROLL/RESULTS switch and the MODIFY/RESULTS switch to select the desired FRAMING, SIGNAL FORMAT, OUTPUT CLOCK (choose RECovered), LINE BUILDOUT, AND IMPEDANCE.

(4) Use the BRIDGE/TERMINATE/MONITOR switches to configure the 2048 kb/s E and F inputs to the line interface being accessed.

(5) Connect the E SIDE and F SIDE inputs each to a 2048 kb/s PCM circuit. Each side is an independent monitor and may be treated as such.

Results Selection

Use the MENU switch to select the 2048K RESULTS menu. Before performing a test, press the RESULTS RESET switch to set all results counters to zero and extinguish all HISTORY LEDs. The E SIDE and F SIDE

results can be observed independently: use the SCROLL/RESULTS switch to observe the E SIDE RECEIVE results and the MODIFY/RESULTS switch to observe the F SIDE RECEIVE results.

Status and Alarms

Observe the E SIDE STATUS LEDs and the F SIDE STATUS LEDs to monitor the status and alarms for each PCM circuit. The INTERCEPTOR always monitors RESULTS, STATUS, and ALARMS when connected to a PCM circuit.

4.2.2 Operation as a Timeslot Monitor

The INTERCEPTOR can be used to monitor timeslots within each of the 2048 kb/s data streams. The user can monitor one timeslot or multiple (N x 64 kb/s), contiguous or non-contiguous timeslots. In this application, the INTERCEPTOR is transparent to the two 2048 kb/s streams. The 2048 kb/s signals will not be disturbed while monitoring live voice frequency or data information.

In monitor mode, the INTERCEPTOR drops the data from the first selected 64 kb/s timeslot from the E SIDE and F SIDE 2048 kb/s data streams to all the interfaces present in the instrument. These include the received byte, VF jacks, the front-panel speaker, X.21 data port, and the G.703 interface (if installed).

The INTERCEPTOR also drops the received signalling information for the selected timeslot on the E SIDE and F SIDE 2048 kb/s data streams. Signalling information is dropped to the front-panel LEDs and the E&M signalling interface (if installed) when MFAS framing is selected.

Set-Up

This step-by-step procedure may be followed to monitor timeslots on a full-duplex 2048 kb/s circuit. In addition, the 2048 kb/s data streams may also be monitored via the STATUS LEDs and the 2048K RESULTS selection of the menu switch.

NOTE: This procedure is intended as a guide; it is not the only available operating sequence.

(1) Check that the AC voltage selection on the side panel is set properly and that the fuseholder is in the proper position (115 VAC or 230 VAC). Connect power to the INTERCEPTOR and press the side-panel POWER switch to the ON position.

(2) The INTERCEPTOR will power-up in the MONITOR mode, indicated by the backlighted DROP panel labels and down arrows (adjacent to the MODE switch). Use the E TO F and F TO E SETUP menus to configure the INTERCEPTOR for the 2048 kb/s signals being connected to the E and F side inputs as described in Section 4.2.1.

(3) Press the MENU switch to select the TIME SLOT & RATE menu. Press the SCROLL/RESULTS switch down once, then select the data rate to be monitored (N x 64 kb/s) by pressing the MODIFY/ RESULTS switch.

(4) After selecting the data rate, press the SCROLL/RESULTS switch down to select the E side drop timeslots. An arrow pointing down indicates a timeslot to be dropped. Use the cursor pushbuttons to move the cursor to select or clear a timeslot. Note that the left side of the display shows the TIMESLOT NUMBER (TS#) which corresponds to the cursor position. Press the MODIFY/RESULTS switch to display either an arrow (for selecting the timeslot) or a dot (to clear the timeslot). The number of timeslots selected must match the previously selected data rate. For instance, if a 192 kb/ s data rate was selected in step (3), exactly three (3 x 64 kb/s = 192 kb/s) timeslots must be selected.

(5) Repeat the procedure in step (4) for timeslot selection for E SIDE INSERT (an arrow pointing up indicates a timeslot to be inserted into), F SIDE DROP, and F SIDE INSERT. The appropriate number of timeslots **must** be selected in all four of these drop and insert menus in order to access any other SETUP menu with the MENU switch. Remember that all of these timeslot set-ups must match the data rate that was selected, even if no insert operation is planned.

NOTE: If any timeslot set-up does not match the selected data rate, the unit will remain in the TIME SLOT & RATE menu and will not allow access to other menus. The condition must be corrected by changing the data rate or correcting the timeslot selections.

(6) Use the BRIDGE/TERMINATE/MONITOR switches to configure the 2048 kb/s E and F inputs to the line interface being accessed.

(7) Connect the E SIDE and F SIDE inputs each to a 2048 kb/s PCM circuit. Each side is an independent monitor and may be treated as such.

Results Selection

Use the MENU switch to select the 64K RESULTS menu. Before performing a test, press the RESULTS RESET switch to set all results counters to zero and extinguish all HISTORY LEDs. The E SIDE and F SIDE results can be observed independently: use the SCROLL/RESULTS switch to observe the E SIDE RECEIVE results and the MODIFY/RESULTS switch to observe the F SIDE RECEIVE results. Note that the 64K RESULTS apply only to the first (lowest) timeslot selected the DROP E and DROP F menus.

Status and Alarms

Observe the E SIDE STATUS LEDs and the F SIDE STATUS LEDs to monitor the status and alarms for each PCM circuit. Note that the 64KBPS AIS LED applies only to the first (lowest) timeslot selected in the DROP E and DROP F menus.

Monitoring Full-Duplex Data

To monitor full-duplex data at N x 64 kb/s, select the desired data rate and timeslots. Connect a data test set to the 15-pin "D" type connector labelled DATA PORT. If a data rate greater than 64 kb/s is selected, make sure that the external data set is configured for the same data rate as the INTERCEPTOR. The selected N x 64 kb/s data rate will be available at the data port for each of the selected timeslots of each 2048 kb/s input.

Monitoring 64 kb/s Data with the G.703 Interface

To monitor full-duplex data with the G.703 interface, select the 64 kb/s data rate and the desired timeslot on the E and F sides. Connect a G.703 test set to the two side-panel G.703 connectors. The desired 64 kb/s timeslot from the F side will be present on the top jack; the E side timeslot will be available on the bottom jack.

Monitoring Voice Frequency (VF) Channels

When monitoring two independent VF channels with an external VF test set, the VF information from the selected 64 kb/s channel on the E SIDE input will be available at the top three-pin banana jack labelled MON E (with backlighting). Connect a VF test set with 600-ohms impedance to this connector to monitor the E SIDE VF channel. If a data rate greater than 64 kb/s is selected, only the first (lowest) timeslot will be decoded and sent to the MON E jack.

The VF information decoded from the selected 64 kb/s channel on the F SIDE INPUT will be available at the bottom three-pin banana jack labelled MON F with backlighting. Connect a VF test set with 600-ohm impedance to this connector to monitor the F SIDE VF channel. If a data rate greater than 64 kb/s is selected, only the first (lowest) timeslot will be decoded and sent to the MON F jack.

Monitoring Full-Duplex Conversation

When monitoring a full-duplex conversation via the INTERCEPTOR's internal speaker, the VF information decoded from the selected 64 kb/s channel is routed to the speaker. Prior to routing, the E SIDE and F SIDE channels are combined so a full-duplex conversation can be monitored. Press the VOL switch to control the volume.

Monitoring Channel-Associated Signalling

To monitor SIGNALLING, use the MENU switch to select the E TO F SETUP menu. Use the SCROLL/RESULTS switch to select FRAMING, then use the MODIFY/RESULTS switch to select MFAS (Multiframe Alignment Signal). This reserves timeslot 16 for the Channel-Associated Signalling bits (ABCD) and allows the INTERCEPTOR to monitor those bits. Press the SCROLL/RESULTS switch to go back to SCROLL.

Use the same procedure to set up signalling monitoring in the F TO E SETUP menu.

With MFAS selected, the Signalling Bits (ABCD) for the selected 64 kb/s channel on the E SIDE are displayed with the four yellow LEDs in the SIGNALLING section labelled A,B,C,D FROM E. The F SIDE Signalling Bits for the selected 64 kb/s channel are displayed with the four yellow LEDs in the same section labelled A,B,C,D FROM F.

The Signalling Bits displayed for the E SIDE or the F SIDE are the four bits associated with the selected channel for each side in the TIME SLOT & RATE menu. If a data rate greater than 64 kb/s was selected, the first (lowest) timeslot's signalling will be displayed.

Monitoring E&M Signalling

To monitor E&M signalling, select the 64 kb/s data rate and the desired timeslot on the E and F sides. Connect an E&M signalling test set to the E&M connector on the side panel. The middle pin of the connector will contain the E side signalling information for the selected timeslot; the bottom pin will present the F side signalling information.

4.2.3 Operating as a Channel Access Drop and Insert

The INTERCEPTOR can be used as a full-duplex, N x 64 kb/s drop and insert device to access data and VF information, the NOT Frame Word (NOT FAS), and (independently) channel-associated signalling. In this application, the INTERCEPTOR is transparent to the 2048 kb/s stream(s) until the user selects INSERT; when selected, the specified timeslots will have their information replaced by either the INTERCEPTOR or an external test instrument. The E SIDE STATUS and the F SIDE STATUS LEDs monitor the two independent 2048 kb/s inputs simultaneously during all operations, including drop and insert.

Channel access is accomplished by selecting the appropriate data rate and timeslot in the TIME SLOT & RATE menu. One of eight main menus, TIME SLOT & RATE is the default selection at power-up time. When not selected, this menu is chosen by pressing the MENU switch until the TIME SLOT & RATE LED is illuminated. Note that the INTERCEPTOR can access any number of timeslots by selecting the appropriate data rate. For example, if a data rate of 256 kb/s is selected, the INTERCEPTOR will enable the selection of four 64 kb/s timeslots.

In DROP and INSERT mode, the INTERCEPTOR drops the data from the first selected 64 kb/s timeslot of the E SIDE or F SIDE 2048 kb/s data streams. The "dropped" information is passed to all the interfaces on the instrument, including the received byte, VF jacks, the front-panel speaker, X.21 data port, and the G.703 interface (if installed). If more than one timeslot is selected, all timeslots will appear on the X.21 data port at the selected data rate.

In MFAS mode, the INTERCEPTOR also drops the received signalling information for the selected timeslot on both the E SIDE and F SIDE 2048 kb/s data streams to the front-panel LEDs.

If the E&M signalling interface is present, the signalling information for the timeslot selected on the E SIDE or F SIDE is encoded for output to E&M signalling equipment.

General Set-Up

This step-by-step procedure may be followed to prepare to access DATA, VF, the NOT FAS word, and signalling information on a full-duplex 2048 kb/s PCM circuit.

NOTE: This procedure is intended as a guide; it is not the only available operating sequence.

(1) Check that the AC voltage selection on the side panel is set properly and that the fuseholder is in the proper position (115 VAC or 230 VAC). Connect power to the INTERCEPTOR and press the side-panel POWER switch to the ON position.

(2) The INTERCEPTOR will power-up in the MONITOR mode, indicated by the backlighted DROP panel labels and down arrows (adjacent to the MODE switch). Use the E TO F and F TO E SETUP menus to configure the INTERCEPTOR for the 2048 kb/s signals being connected to the E and F side inputs as described in Section 4.2.1.

(3) Press the MENU switch to select the TIME SLOT & RATE menu. Press the SCROLL/RESULTS switch down once, then select the data rate to be monitored (N x 64 kb/s) by pressing the MODIFY/ RESULTS switch.

(4) After selecting the data rate, press the SCROLL/RESULTS switch down to select the E side drop timeslots. An arrow pointing down indicates a timeslot to be dropped. Use the cursor pushbuttons to move the cursor to select or clear a timeslot. Note that the left side of the display shows the TIMESLOT NUMBER (TS#) which corresponds to the cursor position. Press the MODIFY/RESULTS switch to display either an arrow (for selecting the timeslot) or a dot (to clear the timeslot). The number of timeslots selected must match the previously selected data rate. For instance, if a 192

kb/s data rate was selected in step (3), exactly three (3 x 64 kb/s = 192 kb/s) timeslots must be selected.

(5) Repeat the procedure in step (4) for timeslot selection for E SIDE INSERT (an arrow pointing up indicates a timeslot to be inserted into), F SIDE DROP, and F SIDE INSERT. The appropriate number of timeslots **must** be selected in all four of these drop and insert menus in order to access any other SETUP menu with the MENU switch. Remember that all of these timeslot set-ups must match the data rate that was selected, even if no insert operation is planned.

NOTE: If any timeslot set-up does not match the selected data rate, the unit will remain in the TIME SLOT & RATE menu and will not allow access to other menus. The condition must be corrected by changing the data rate or correcting the timeslot selections.

(6) Use the BRIDGE/TERMINATE/MONITOR switches to configure the 2048 kb/s E and F inputs to the line interface being accessed.

(7) Connect the E SIDE and F SIDE inputs each to a 2048 kb/s PCM circuit. Each side is an independent monitor and may be treated as such.

General Results Selection

Use the MENU switch to select the 64K RESULTS menu. Before performing a test, press the RESULTS RESET switch to set all results counters to zero and extinguish all HISTORY LEDs. The E SIDE and F SIDE results can be observed independently: use the SCROLL/RESULTS switch to observe the E SIDE RECEIVE results and the MODIFY/RESULTS switch to observe the F SIDE RECEIVE results. Note that the 64K RESULTS apply only to the first (lowest) timeslot selected the DROP E and DROP F menus.

Status and Alarms

Observe the E SIDE STATUS LEDs and the F SIDE STATUS LEDs to monitor the status and alarms for each PCM circuit. Note that the 64KBPS AIS LED applies only to the first (lowest) timeslot selected in the DROP E and DROP F menus.

Inserting Signalling Bits

To insert signalling bits, follow this step-by-step procedure:

(1) Using the MODE switch, select the direction in which signalling bits are to be inserted by choosing either DROP and INSERT on the E SIDE or the F SIDE (as indicated by the backlighted arrows).

(2) Set the MENU switch to the TIME SLOT & RATE position to select the timeslot in which the signalling bits are to be inserted.

(3) Select the interface from which signalling information is to be inserted. If the E&M option is not installed, use the four front-panel ABCD signalling switches.

a. To select the switches on the front panel, go to the AUXILIARY menu and select ABCD under SIGNALLING.

Position the four switches labelled TRANSMIT (located in the SIGNALLING area of the front panel) to set the desired values of the A, B, C, and D signalling bits. A switch in the UP position sets the bit value to 1; the DOWN position sets the bit value to 0.

b. To select the E&M signalling interface, go to the AUXILIARY menu and select E&M under SIGNALLING.

Connect an E&M signalling source to the bottom pin (M-lead) on the E&M connector located on the INTERCEPTOR's side panel. If an EARTH-ON condition is detected, the INTERCEPTOR inserts a 0101 pattern for the selected N x 64 timeslots; if an EARTH-OFF condition is detected, the INTERCEPTOR inserts a 1101 pattern.

(4) Press the INSERT switch (located in the signalling area of the INTERCEPTOR's front panel) to activate the insertion of signalling bits. When pressed, the switch will immediately flash to indicate that insertion is about to begin. The user may abort the insertion activity by pressing the switch while it is flashing; however, insertion has already started once the switch is steadily illuminated.

Signalling bits may be changed while the INTERCEPTOR is in signalling insertion mode.

(5) Signalling information received for the timeslots selected on both the E SIDE and the F SIDE is always reflected by the ABCD signalling LEDs on the front panel.

When the E&M option is present, the proper EARTH-ON/EARTH-OFF conditions for the received signalling information on either the E side or F side is available at the middle pin (E-lead) of the E&M connector on the side panel.

Byte Insertion

The INTERCEPTOR can be used to insert an eight-bit byte into any timeslot. It can appear at either the 2048 kb/s E SIDE or F SIDE TRANSMIT output. To insert a byte, follow these step-by-step procedures:

(1) Press the MODE switch to select the desired 2048 kb/s output.

(2) Set the MENU switch to the TIME SLOT & RATE position.

(3) Configure the INSERT menus to select the desired timeslots.

(4) Configure the DROP menus to select the desired timeslots.

NOTE: The number of timeslots dropped must match the number of timeslots inserted (which, in turn, must match the selected data rate). The same timeslots do not have to be dropped and inserted.

(5) Set the MENU switch to the INTERFACE position. Scroll through the selections until INSERT BYTE is displayed.

(6) If desired, change the values within the byte by scrolling the cursor to the appropriate bit and then pressing the MODIFY/RESULTS switch.

(7) Press the INSERT switch to activate byte insertion. When pressed, the switch will immediately flash to indicate that insertion is about to begin. The user may abort the insertion activity by pressing the switch while it is flashing; however, insertion has already started after the switch is steadily illuminated.

NOTE: Any byte may be changed while the INTERCEPTOR is in byte insertion mode.

(8) The received byte for the first 64 kb/s timeslot on both the E SIDE and F SIDE will be displayed under the 64K RESULTS menu.

(9) When the activity is completed, press the INSERT switch to remove the INTERCEPTOR from byte insertion mode.

Inserting Data Through The Data Port

The INTERCEPTOR can be used to insert data into any timeslot. It can appear at either the 2048 kb/s E SIDE or F SIDE TRANSMIT output. To insert data through the data port, follow these step-by-step procedures:

(1) Press the MODE switch to select the desired 2048 kb/s output.

(2) Set the MENU switch to the TIME SLOT & RATE position.

(3) Configure the INSERT menus to select the desired timeslots.

(4) Configure the DROP menus to select the desired timeslots.

NOTE: The number of timeslots dropped must match the number of timeslots inserted (which, in turn, must match the selected data rate). The same timeslots do not have to be dropped and inserted.

(5) Set the MENU switch to the INTERFACE position. Scroll through the selections until DATA PORT is displayed.

(6) Connect to the 15-pin "D"-type connector labelled Data Port a data test set configured for the same data rate as selected in Step (3) .

(7) Press the INSERT switch to activate the insertion of data. When pressed, the switch will immediately flash to indicate that insertion is about to begin. The user may abort the insertion activity by pressing the switch while it is flashing; however, insertion has already started after the switch is steadily illuminated.

NOTE: Any byte may be changed while the INTERCEPTOR is in the data insertion mode.

(8) Data for the N x 64 kb/s timeslots selected from the E SIDE or the F SIDE 2048 kb/s data streams will be available on the 15-pin "D"-type connector labelled Data Port.

(9) When the activity is completed, press the INSERT switch to remove the INTERCEPTOR from data insertion mode.

Inserting Data From the 64 kb/s G.703 Interface

If the G.703 option is installed, the INTERCEPTOR can be used to insert 64 kb/s data received at the G.703 interface into any timeslot on either the E SIDE or the F SIDE 2048 kb/s output. To perform this activity, follow these step-by-step procedures:

(1) Press the MODE switch to select the desired 2048 kb/s output.

(2) Set the MENU switch to the TIME SLOT & RATE position.

(3) Configure the INSERT menus to select the desired timeslots.

NOTE: The number of timeslots selected must match the data rate. For instance, if a 192 kb/s data rate is selected, three timeslots must be selected.

(4) Configure the DROP menus to select the desired timeslots.

NOTE: The number of timeslots dropped must match the number of timeslots inserted (which, in turn, must match the selected data rate). The same timeslots do not have to be dropped and inserted.

(5) Set the MENU switch to the INTERFACE position. Scroll through the selections until G.703 is displayed. Choose BRIDGE or TERMINATE for the input impedance, as appropriate.

(6) Connect a codirectional G.703 test instrument to the top three-pin banana jack located on the INTERCEPTOR's side panel.

(7) Press the INSERT switch to activate the insertion of the received data. When pressed, the switch will immediately flash to indicate that insertion is about to begin. The user may abort the insertion activity by pressing the switch while it is flashing; however, insertion has already started after the switch is steadily illuminated.

(8) The first 64 kb/s timeslot selected in the DROP menu will be encoded and present at the bottom three-pin banana jack of the G.703 Interface on the INTERCEPTOR's side panel.

(9) When the activity is completed, press the INSERT switch to remove the INTERCEPTOR from insertion mode.

Tone Insertion

The INTERCEPTOR has the ability to insert a 1020 Hz tone into any timeslot. It can appear at either the 2048 kb/s E SIDE or F SIDE TRANSMIT output. To insert the 1020 Hz tone, follow these step-by-step procedures:

(1) Press the MODE switch to select the desired 2048 kb/s output.

(2) Set the MENU switch to the TIME SLOT & RATE position.

(3) Configure the INSERT menus to select the desired timeslots.

(4) Configure the DROP menus to select the desired timeslots.

NOTE: The number of timeslots dropped must match the number of timeslots inserted (which, in turn, must match the selected data rate). The same timeslots do not have to be dropped and inserted.

(5) Set the MENU switch to the INTERFACE position. Scroll through the selections until INSERT 1020 HZ TONE is displayed.

(6) Press the INSERT switch to activate the 1020 Hz tone. When pressed, the switch will immediately flash to indicate that tone insertion is about to begin. The user may abort the activity by pressing the switch while it is flashing; however, tone insertion has already started after the switch is steadily illuminated.

(7) VF-encoded data from the selected timeslot on the E SIDE or F SIDE will be present at the bottom three-pin banana jack and at the speaker.

(8) When the activity is completed, press the INSERT switch to remove the INTERCEPTOR from tone insertion mode.

VF Insertion

The INTERCEPTOR has the ability to insert VF information into any timeslot. It can appear at either the 2048 kb/s E SIDE or F SIDE TRANSMIT output and can interface to the INTERCEPTOR either through the VF jacks or through the speaker/microphone. Both of these interfaces are located on the right side of the instrument.

To insert VF information, follow these step-by-step procedures:

(1) Press the MODE switch to select the desired 2048 kb/s output.

(2) Set the MENU switch to the TIME SLOT & RATE position.

(3) Configure the INSERT menus to select the desired timeslots.

(4) Configure the DROP menus to select the desired timeslots.

NOTE: The number of timeslots dropped must match the number of timeslots inserted (which, in turn, must match the selected data rate). The same timeslots do not have to be dropped and inserted.

(5) Set the MENU switch to the INTERFACE position. Scroll through the selections until VF is displayed.

(6) Press the INSERT switch to activate VF insertion. When pressed, the switch will immediately flash to indicate that insertion is about to begin. The user may abort the activity by pressing the switch while it is flashing; however, VF insertion has already started after the switch is steadily illuminated.

NOTE: When the INSERT switch is illuminated, insertion through the VF jacks is occurring. If no connection is made to the VF jacks, any noise which may be present on the open INSERT jack is inserted into the selected timeslots. If VF information is to be inserted through the speaker/microphone, press the TALK pushbutton and aim your voice in the direction of the speaker. Note that pressing the TALK pushbutton overrides VF information received on the VF jacks.

(7) VF-encoded data from the first selected timeslot on the E SIDE or F SIDE will be present at the lower three-pin VF banana jack located on the INTERCEPTOR's front panel and at the speaker.

(8) When the activity is completed, press the INSERT switch to remove the INTERCEPTOR from VF insertion mode.

NOT FAS WORD INSERTION

The INTERCEPTOR has the ability to modify seven bits of the NOT FAS word and insert them into every other timeslot 0 on the 2048 kb/s data stream. Bit 2 of the NOT FAS word cannot be modified and is always set to "1".

To insert the NOT FAS word, use the following procedure:

(1) Press the MODE switch to select the desired 2048 kb/s output.

(2) In the AUXILIARY menu, set the INSERT NOT FAS function to YES.

(3) In the AUXILIARY menu, modify the NOT FAS word as required.

(4) Press the INSERT switch to activate NOT FAS word insertion. When pressed, the switch will immediately flash to indicate that insertion is about to begin. The user may abort the activity by pressing the switch while it is flashing; however, NOT FAS insertion has already started after the switch is steadily illuminated.

(5) When the activity is completed, press the INSERT switch to remove the INTERCEPTOR from VF insertion mode.

NOTE: Bit 3 of the NOT FAS word is the FAS DISTANT ALARM BIT. If you are using the INTERCEPTOR's internal clock with no input (transmit-only mode), the INTERCEPTOR outputs a 2048 kb/s data stream with a "1" for Bit 3 of the NOT FAS word. If the user modifies the NOT FAS word using the INSERT function and then stops the INSERT function, Bit 3 of the NOT FAS word will remain as it was set in the AUXILIARY menu.

PRINTER/REMOTE CONTROL INTERFACES

5.1 INTRODUCTION

This section contains detailed information about the INTERCEPTOR 264's printing and remote control capabilities. The instrument offers a built-in V.24 and an optional IEC-625 printer/remote control interface.

5.2 GENERAL DESCRIPTION

The INTERCEPTOR features printer/remote control interfaces that allow the user to obtain hard-copy printouts of all results and configurations. These interfaces also allow a remote user to exercise full control over all normal INTERCEPTOR functions (except power).

The INTERCEPTOR's printer/remote control interfaces are designed to communicate with a user operating a dumb terminal. In this mode, the INTERCEPTOR runs interactively, sending a prompt character to the terminal when it is ready to receive a command, and echoing all command characters back to the terminal as the user types them. The INTERCEPTOR also provides full on-line help to aid the user in entering commands.

5.3 PRINTER INTERFACE SELECTION

The INTERCEPTOR may be connected to a V.24 external printer or may communicate with a printer via the IEC-625 interface. When both interfaces are installed, the PRINT function under the AUXILIARY menu is used to select which interface the INTERCEPTOR will print to. If only one interface is installed, the INTERCEPTOR will default to that interface.

The printer selection function is controlled by the AUXILIARY function of the MENU switch. When selected, the following soft-key labels are displayed:

(1) V24 - Select V.24 only
(2) IEC - Select IEC-625 only

5.4 REMOTE CONTROL INTERFACE SELECTION

The INTERCEPTOR can operate in one of two control modes: Local or Remote. On power-up, the INTERCEPTOR enters Local mode: the front-panel switches control all functions. Upon receipt of a valid remote control command, the INTERCEPTOR enters Remote mode: all front-panel switches are ignored and all INTERCEPTOR functions are controlled by the remote user.

Either the V.24 or the IEC-625 interface may control the INTERCEPTOR at any given time. The Remote function selection is accessed through the auxiliary function of the menu switch. When this function is selected, the following softkey labels will be displayed.

(1) V.24 - select V.24 only
(2) IEC-625 - select IEC-625 only

5.5 V.24 PRINTER/REMOTE CONTROL INTERFACE DESCRIPTION

The INTERCEPTOR can be connected to a printer to generate hard copies of machine states, status and results, or to a computer or terminal for remote control operation. Communication through the V.24 port is asynchronous using standard ASCII characters. The baud rate, character format, parity, and number of stop bits can be selected using the AUXILIARY menu.

The following is a list of the V.24 interface pins and their associated functions:

pin 1:	protective ground	connected to chassis ground.
pin 2:	transmit data	data transmitted to the INTERCEPTOR.
pin 3:	receive data	data received from the INTERCEPTOR.
pin 5:	clear to send	input true when the device is ready to receive.
pin 6:	data set ready	output true when the INTERCEPTOR is on.
pin 7:	signal ground	connected to circuit ground.
pin 8:	data carrier detect	Not Used.
pin 11:	+12v	reserved for future use.
pin 13:	signal ground	connected to circuit ground
pin 20:	data terminal ready	INTERCEPTOR sets line true when it is ready to send data

The V.24 function, located in the AUXILIARY menu, controls the V.24 communication port configuration. Four parameter categories may be controlled: baud rate, the number of data bits per character, parity, and the number of stop bits. The baud rate may be set to 110, 300, 600, 1200, 2400, 4800, and 9600. The number of data bits may be either 7 or 8. The parity may be odd, even, or none. The number of stop bits may be 1, 1.5, or 2. The default settings for the INTERCEPTOR are: 2400 baud, 7 data bits, even parity, 2 stop bits. If reconfigured, the INTERCEPTOR remembers the new settings when powered down.

If the controller sends commands to the INTERCEPTOR faster than the INTERCEPTOR can process them (i.e., if the controller ignores the CLEAR TO SEND output from the INTERCEPTOR), the command(s) is discarded. As a precaution, it is suggested that the controller either monitor the CLEAR TO SEND signal output by the INTERCEPTOR or allow the INTERCEPTOR ample processing time following each command. (200 milliseconds is a conservative figure for most commands).

5.6 IEC-625 PRINTER/REMOTE CONTROL INTERFACE DESCRIPTION

The INTERCEPTOR IEC-625 interface complies with the IEEE Standard Digital Interface for Programmable Instrumentation (STD 488 - 1978). The interface offers both Talk-Only and Addressable modes. When operating in Talk-Only mode, the INTERCEPTOR should be connected directly to a listen-only printer. In Addressable mode, the INTERCEPTOR may be connected with up to 14 other devices, one of which must be a controller.

The side-panel DIP switch (located on the IEC-625 panel) is used to select both the interface mode and the INTERCEPTOR's interface address (in addressable mode only). The DIP switch configuration is as follows:

	SW1	SW2	SW3	SW4	SW5	SW6
1=UP						Addressable
0=DOWN	A0	A1	A2	A3	A4	Talk Only

NOTE: Dip switch settings are only read at power-up.

A0-A4 are the unit addresses; Addressable/Talk Only selects the operating mode. Note that remote control is available in Addressable mode only. Additionally, when operating in addressable mode, the INTERCEPTOR responds to the Device Clear (DCL) command by performing a re-power-up or test restart.

The IEC-625 function, located in the AUXILIARY menu, provides control over the IEC-625 communication port configuration. Only the service request parameter may be controlled. If service request is set to DATA, the INTERCEPTOR generates a service request (SRQ) when an erroneous command is received or when it has data to transmit. If service request is set to ERROR, the INTERCEPTOR generates a service request only when an erroneous command is received. In either case, the INTERCEPTOR sets the most significant bit of its serial poll register (dav) whenever it has data to transmit (see Figure 5-1).

Figure 5-1
Serial Poll Status Byte

B7	B6	B5	B4	B3	B2	B1	B0
dav	rsv						syn

dav= data available in INTERCEPTOR print buffer
rsv= request service (SRQ)
syn= command syntax error

The line terminator transmitted from the INTERCEPTOR to the IEC-625 interface may be set to carriage return (CR), linefeed (LF), both (CRLF) or none. This is done by using the REMOTE function under the AUXILIARY menu. Regardless of mode or terminator selection, the EOI signal is raised with the final character of each line.

The default settings for the INTERCEPTOR are: error service request and CRLF line terminator. If reconfigured, the INTERCEPTOR remembers the new settings when powered down.

The IEC-625 bus requires that one device on the bus act as controller. All other devices connected to the bus must act as slaves to that controller. Since the INTERCEPTOR can only act as a slave, another intelligent device must be used on the bus as the bus controller.

Devices that are commonly used as a controller include the following:

- Hewlett-Packard HP-85 computer with the 82937 Interface.
- IBM-PC with a National Instruments GPIB-PC interface card and system software.

In most cases, a software program is required to operate the controller.

5.6.1 IEC-625 Programming Hints

- A device must be addressed to respond to a command. It is possible to address any single device or any group of devices on the bus.
- Addressing a single device is accomplished with a statement such as Output (701); "DAT63" to the device at address 1 of the HP-85's port 7.
- To address multiple devices using the HP-85, the REMOTE x,x,x statement is used. The x's represent a list of devices to be addressed. Once addressed, the group format of the commands may be used. One example is "Trigger 7," which causes all addressed devices on the bus to perform their DEVICE Trigger function.
- Before attempting to read data from a device, it is necessary to know if the device has data to send.
- The controller has two ways of determining if the INTERCEPTOR has data: (1) bit 7 of the serial poll register (dav) is set whenever a line of data is availablel or (2) if the INTERCEPTOR IEC SRQ mode selection is set to DAT, the INTERCEPTOR makes a service request to the IEC-625 controller whenever it has data available.
- The statement used to read data from the INTERCEPTOR must be one that terminates the read operation when the last character of the line is encountered. Since it is up to the user to specify the INTERCEPTOR line terminator (CR, LF, CRLF), the best way to detect the last character is by sensing the EOI signal.
- The HP-85 statement "ENTER 701 USING "#%, %K",A$" reads character from device 1 until the EOI signal is encountered.

5.7 PRINTER FORMATS

The INTERCEPTOR printouts can be divided into three broad categories: results printouts, control printouts, and status printouts. Each is discussed in the following sections.

5.7.1 Results Printouts

A results printout is a hard copy of all results available in the results menus. The printout also lists the present state of the front-panel status LEDs. A results printout is initiated by setting the front-panel PRINT switch to the RESULTS position. Figure 5-2 is a sample results printout.

Results can be printed at a programmable time interval from 1 minute to 6 hours. At the end of each time period, a printout is automatically generated. The interval is selected using the PRINT EVENT menu. Selecting OFF turns the automatic printing feature off.

A signalling summary printout is also available under the PRINT EVENT menu. When selected, the signalling summary delivers a hard copy of the last 100 signalling events detected for a selected 64 kb/s channel, along with the time and date of each change. Figure 5-3 depicts a sample signalling summary printout.

5.7.2 Controls Printouts

A controls printout is a hard copy of the current settings of the front-panel's user-selectable controls, along with the current time and date. Controls prints allow the user to easily duplicate machine settings when an identical test set-up is needed. These printouts are selectable by pressing the front-panel PRINT switch to the CONTROLS position. Figure 5-4 depicts a sample controls printout.

5.7.3 Events Printouts

An events printout is generated on the occurrence of a selectable condition. These conditions, which include error and signalling, can be selected under the PRINT EVENT menu.

When ERRORS is selected, any CODE, FAS, MFAS, or CRC-4 error, or any FAS WORD or NOT FAS WORD change causes a printout which

TIME 09-JAN-90 4:08:59:225 PM

RESULTS	E SIDE	F SIDE
RECEIVE BYTE	10101010	10101010
RECEIVE FREQUENCY	2047998.9	2047998.9
FAS WORD	C0011011	C001X0XX
NOT FAS	C1011011	C1011111
FAS ERRORS	0	991
MFAS ERRORS	1	15244
CODE ERRORS	1	8651899
CRC4 ERRORS	32	40386
FAS ERROR RATE	0 E-07	1.56 E-04
MFAS ERROR RATE	1 E-06	1.92 E-02
CRC4 ERROR RATE	2.0 E-05	2.54 E-02
CODE ERROR RATE	3 E-10	2.66 E-03

E SIDE STATUS	CURRENT	HISTORY
SIGNAL	GREEN	OFF
FRAME SYNC	GREEN	RED
MF SYNC	GREEN	RED
CRC PRESENT	YELLOW	
HDB3 CODE	YELLOW	
AIS	OFF	OFF
TS-16 AIS	OFF	OFF
FAS DISTANT	OFF	OFF
MFAS DISTANT	OFF	YELLOW
64KBPS AIS	OFF	OFF

F SIDE STATUS	CURRENT	HISTORY
SIGNAL	GREEN	OFF
FRAME SYNC	GREEN	RED
MF SYNC	GREEN	RED
CRC PRESENT	YELLOW	
HDB3 CODE	YELLOW	
AIS	OFF	OFF
TS-16 AIS	OFF	OFF
FAS DISTANT	OFF	OFF
MFAS DISTANT	OFF	OFF
64KBPS AIS	OFF	OFF

Figure 5-2
Sample Results Printout

```
E SIDE SIGNAL SUMMARY          A B C D
-----------------------------------------

09-JAN-90    4:14:55:023 PM   0 0 1 1
09-JAN-90    4:14:55:667 PM   0 1 1 1
09-JAN-90    4:14:57:857 PM   0 1 0 1
09-JAN-90    4:15:00:397 PM   0 1 0 0
09-JAN-90    4:15:01:151 PM   1 1 0 0
09-JAN-90    4:15:01:761 PM   1 0 0 0
09-JAN-90    4:15:02:373 PM   1 0 1 0
09-JAN-90    4:15:03:175 PM   1 0 1 1
09-JAN-90    4:15:03:785 PM   0 0 1 1
09-JAN-90    4:15:04:397 PM   0 0 0 1
09-JAN-90    4:15:05:009 PM   0 0 0 0
09-JAN-90    4:15:05:623 PM   1 0 0 0
09-JAN-90    4:15:06:233 PM   1 0 1 0
09-JAN-90    4:15:07:185 PM   1 0 1 1
09-JAN-90    4:15:07:795 PM   0 0 1 1
09-JAN-90    4:15:08:407 PM   0 0 0 1

F SIDE SIGNAL SUMMARY          A B C D
-----------------------------------------

09-JAN-90    4:14:55:023 PM   0 0 1 1
09-JAN-90    4:14:55:667 PM   0 1 1 1
09-JAN-90    4:14:57:857 PM   0 1 0 1
09-JAN-90    4:15:00:397 PM   0 1 0 0
09-JAN-90    4:15:01:151 PM   1 1 0 0
09-JAN-90    4:15:01:761 PM   1 0 0 0
09-JAN-90    4:15:02:373 PM   1 0 1 0
09-JAN-90    4:15:03:175 PM   1 0 1 1
09-JAN-90    4:15:03:785 PM   0 0 1 1
09-JAN-90    4:15:04:397 PM   0 0 0 1
09-JAN-90    4:15:05:009 PM   0 0 0 0
09-JAN-90    4:15:05:624 PM   1 0 0 0
09-JAN-90    4:15:06:233 PM   1 0 1 0
09-JAN-90    4:15:07:185 PM   1 0 1 1
09-JAN-90    4:15:07:795 PM   0 0 1 1
09-JAN-90    4:15:08:407 PM   0 0 0 1
```

Figure 5-3
Sample Signalling Summary Printout

```
TIME            09-JAN-90   4:09:55:375 PM
CONTROLS
-----------------------------------------

E DROP TIMESLOT (1-15)  !..............
                (16-31) *..............

E INS  TIMESLOT (1-15)  !..............
                (16-31) *..............

F DROP TIMESLOT (1-15)  !..............
                (16-31) *..............

F INS  TIMESLOT (1-15)  !..............
                (16-31) *..............

DATA RATE          (kbps)          64
INTERFACE                     DATA PORT
TRANSMIT BYTE                 01111110
PRINT TIME                         OFF
ERROR EVENT                        OFF
SIGNALLING EVENT                   OFF

E->F FRAMING                  MFAS-CRC
E->F SIGNAL FORMAT                HDB3
E->F OUTPUT CLOCK                  REC
E->F LINE BUILD OUT (dB)             0
E->F IMPEDANCE                120 BAL

E<-F FRAMING                  MFAS-CRC
E<-F SIGNAL FORMAT                HDB3
E<-F OUTPUT CLOCK                  REC
E<-F LINE BUILD OUT (dB)             0
E<-F IMPEDANCE                120 BAL

STOP BITS                            2
PARITY                             ODD
BAUD RATE                         2400
DATA BITS                             7
SERVICE REQUEST                  DATA
PRINT LAYOUT                       FWD
PRINT LINE TERMINATOR             CRLF
PRINTER INTERFACE                  IEC
REMOTE LINE TERMINATOR            CRLF
REMOTE INTERFACE                  V.24
INSERT NOT FAS                      NO
TRANSMIT NOT FAS              1X011111
SIGNALLING SOURCE                ABCD
MODE                          MON ONLY
E INPUT                      TERMINATE
F INPUT                      TERMINATE
INSERT                             OFF
SIGNALLING INSERT                  OFF
TX SIGNALLING ABCD                0000
```

Figure 5-4
Sample Controls Printout

details the time and date, type of error, and error count. The minimum time between error printouts is one second. If more than one error is detected between printouts, the error count will reflect it. Figure 5-5 shows several sample Error Event printouts.

If Signalling is selected, a printout is generated for each change in signalling bits detected for the selected 64 kb/s channel. The printout shows the time and date and the new signalling bits. Figure 5-6 shows several sample Signalling Event printouts.

5.8 COMMAND REFERENCE

5.8.1 Terminal Operation and the On-Line HELP Functions

The INTERCEPTOR provides extensive on-line help information to aid the user in operating the instrument from a dumb terminal. This includes a 2-page, on-line, mini-manual and a parameter syntax guide for every remote control command.

To operate the INTERCEPTOR from a dumb terminal:

- Log in by typing a period (".") or the word "TERMINAL" followed by a carriage return.

After log in, the INTERCEPTOR will invite the user to access the main HELP screen by typing "HELP" followed by a carriage return. The main HELP screen will, in turn, describe how to obtain information on specific subjects.

NOTE: The pages associated with the on-line mini-manual are shown in Appendix A.

5.8.2 Remote Control Command Formats

The general format for a remote control command is as follows:

command name(parameter...)

command name is the name of the command (as listed in Section 5.7.6); **(parameter...)** is an optional entry associated with the command. Whenever

```
F SIDE CODE ERROR
09-JAN-90   4:16:38:975 PM     21074235

F SIDE FAS WORD ERR
09-JAN-90   4:16:38:975 PM     C0011011

E SIDE FAS WORD ERR
09-JAN-90   4:16:40:025 PM     CXXXXXXX

F SIDE CODE ERROR
09-JAN-90   4:16:40:025 PM     21074235

F SIDE FAS WORD ERR
09-JAN-90   4:16:40:025 PM     CXXX101X

F SIDE CODE ERROR
09-JAN-90   4:17:41:025 PM     21074237

F SIDE CRC4 ERROR
09-JAN-90   4:17:41:025 PM        99197

F SIDE MFAS ERROR
09-JAN-90   4:17:42:075 PM        38185

F SIDE CODE ERROR
09-JAN-90   4:17:42:075 PM     21074239

F SIDE CRC4 ERROR
09-JAN-90   4:17:42:075 PM        99199

F SIDE CODE ERROR
09-JAN-90   4:17:53:025 PM     21074240

F SIDE CRC4 ERROR
09-JAN-90   4:17:53:025 PM        99200

F SIDE CODE ERROR
09-JAN-90   4:17:54:025 PM     21074241

F SIDE CRC4 ERROR
09-JAN-90   4:17:54:025 PM        99201
```

Figure 5-5
Sample Error Event Printout

```
 SIDE SIGNALING              A B C D
09-JAN-90    4:15:59:828 PM  1 0 0 1

F SIDE SIGNALING             A B C D
09-JAN-90    4:15:59:828 PM  1 0 0 1

 SIDE SIGNALING              A B C D
09-JAN-90    4:16:00:767 PM  1 1 0 1

F SIDE SIGNALING             A B C D
09-JAN-90    4:16:00:767 PM  1 1 0 1

 SIDE SIGNALING              A B C D
09-JAN-90    4:16:01:915 PM  1 1 1 1

F SIDE SIGNALING             A B C D
09-JAN-90    4:16:01:915 PM  1 1 1 1

E SIDE SIGNALING             A B C D
09-JAN-90    4:16:03:226 PM  1 1 1 0

F SIDE SIGNALING             A B C D
09-JAN-90    4:16:03:226 PM  1 1 1 0
```

Figure 5-6
Sample Signalling Event Printout

possible, both remote control command and parameter names correspond with their functional counterparts on the INTERCEPTOR's front panel. In general, remote control names are obtained by shortening all words shown on the front panel to their first three letters; all numbers are unchanged.

Most INTERCEPTOR commands may be used to either select a new command state or view the current command state (without changing it). To select a new command state, both the command name and the desired parameter are entered in the command line. To obtain the currently selected state, only the command name is entered. In other words, entering a command name without selecting a new state will cause the INTERCEPTOR to print the currently selected state. This is referred to as a status request for the particular command.

5.8.3 Remote Control Command Entry Sequence

Although the examples in this manual are listed in upper case only, all commands may be entered in either upper or lower case.

All space characters(" ") are ignored by the INTERCEPTOR and thus may be used freely to make the commands more legible (as is done in all examples throughout this manual).

Entering a BACK-SPACE character (ASCII code 08H, Control H) causes the INTERCEPTOR to discard the most recently entered character.

Entering a CANCEL character (ASCII code 18H, Control X) causes the entire command line currently being entered to be discarded.

All command lines must be terminated by a valid statement terminator, such as a carriage return (ASCII code ODH), a linefeed (ASCII code OAH), or any character transmitted with the EOI line asserted (IEC-625 only). Note that commands are not interpreted by the INTERCEPTOR until a terminator is received.

5.8.4 Pausing INTERCEPTOR Printouts

Entering an X-OFF character (ASCII code 13H, Control S) causes the INTERCEPTOR to temporarily halt all printouts until either an X-ON character (ASCII code 11H, Control Q) or a statement terminator is received.

5.8.5 Aborting INTERCEPTOR Operations

Entering a Control C character (ASCII code 03H, ETX) causes the current input to be discarded and the print buffer to be cleared. This is the "break" command that returns the INTERCEPTOR to normal command mode.

5.9 REMOTE CONTROL COMMANDS

This section of the manual presents all of the remote control commands in alphabetical order. Each command is listed on a separate page. For ease of location, the command name appears in both the upper-left and upper-right corner of each page. Each entry includes an explanation of the command, references to associated commands (where appropriate), and a brief example of command usage. Commands and their variables are highlighted in bold throughout.

Restart and Logoff

BYE
DEVICE CLEAR :short form for DEVICE CLEAR

The **BYE** command returns the INTERCEPTOR to its power-up state. It is typically used to "log out" at the end of a remote control session. When specified, this command ensures that all temporary configurations (such as PROMPT and ECHO) are cleared while leaving all non-volatile RAM (NOVRAM) configurations unchanged. In this way, the next user to "log in" to the INTERCEPTOR is ensured a predictable start-up.

See also: **DEVICE CLEAR**

EXAMPLE:

```
>                    :restart and exit
>BYE                 :note that there is no prompt returned
```

Clear NOVRAM

CLEAR MEMORY :clear NOVRAM and restart the INTERCEPTOR

The **CLEAR MEMORY** command clears INTERCEPTOR NOVRAM and then reinitializes the instrument. This command should be used with extreme caution since it wipes out all current instrument configurations, auxiliary functions, and results. **CLEAR MEMORY** also removes the user from remote control.

EXAMPLE:

>CLEAR MEMORY :clear the NOVRAM, reinitialize to default settings, and exit remote control

Clear the Terminal Screen

CLS

The **CLS** command simply outputs 30 of the selected line terminator sequences (usually a carriage return and linefeed pair for terminals) to the terminal. This command effectively clears the terminal screen of all previous outputs.

EXAMPLE:

```
>CLS                          :Clear the terminal screen
>
```

Display or Set the Date

DATE	:print the date
DATE dd/mm/yy	:set the date

The **DATE** command allows the user to set or display the DATE.

EXAMPLE:

>**DATE 30/09/89**	:set the date
>**DATE**	:display the date
30/SEP/89	
>	

DEVICE CLEAR
BYE :short form for DEVICE CLEAR

The **DEVICE CLEAR** command returns the INTERCEPTOR to its power-up state. It is typically used to "log out" at the end of a remote control session. When specified, this command ensures that all temporary configurations (such as PROMPT and ECHO) are cleared while leaving all non-volatile RAM (NOVRAM) configurations unchanged. In this way, the next user to "log in" to the INTERCEPTOR is ensured a predictable start-up.

See also: **BYE**

EXAMPLE:

```
>                          :restart and exit
>DEVICE CLEAR              :note that there is no prompt returned
```

Front Panel Display Mode

DISPLAY :print the display mode
DISPLAY [LOCAL|REMOTE] :set the display mode

The **DISPLAY** command lets the user determine if the INTERCEPTOR's front-panel display switches are active while under remote control. If **DISPLAY LOCAL** is specified, all switches on the front panel are operational. If **DISPLAY REMOTE** is specified, the front-panel display switches are disabled, allowing only remote control of the instrument.

EXAMPLE:

>DISPLAY LOCAL :set the display under front panel control
>DISPLAY :check the status of the DISPLAY command

Display mode.....Local
>DISPLAY REMOTE :set remote control only
>

Select the ECHO mode

ECHO	:print the echo function status
ECHO [ON|OFF]	:select the echo mode

The **ECHO** command determines whether the INTERCEPTOR echoes characters received from the controller. If **ECHO OFF** is specified, no received characters are echoed. If **ECHO ON** is specified, all received characters are echoed.

EXAMPLE:

>ECHO ON	:set echo on
>ECHO	:print echo status
Echo.....on	
>ECHO OFF	:set echo off
>	

EF FRA	:display **EF FRA**ming type
EF FRA [FAS|FASCRC|MFAS| MFASCRC]	:set **EF FRA**ming type
EF SIG	:display **EF SIG**nal format
EF SIG [AMI|HDB3|RZ|NRZ]	:set **EF SIG**nal format
EF CLO	:display **OUT**put /**CLO**ck source
EF CLO [INT|EXT|REC]	:set **EF OUT**put **CLO**ck source
EF LBO	:display **L**ine **B**uild **O**ut
EF LBO [0 DB|-3 DB|-6 DB]	:set **EF L**ine **B**uild **O**ut
EF IMP	:display **EF** input **IMP**edance
EF IMP [BAL|UNBAL]	:set **EF** input **IMP**edance

The **EF** command allows the user to display or set any of the E to F setup parameters. These include framing format, signal format, output clock source, output attenuation, and input impedance.

EXAMPLE:

>EF IMP	:display EF impedance
E ->F Impedance.....Unbalanced	
>EF IMP BAL	
	:set EF impedance to 120 balanced
>EF SIG RZ	:set signal format to return zero

Warning - EF impedance and EF signal format conflict

	:note — RZ or NRZ format not allowed
>EF IMP UNBAL	:adjust impedance to remove warning
>EF CLO REC	:select recovered clock for output
>EF LBO	:display line build out
E->F Line build out.....-3 dB	
>EF FRA MFASCRC	:select multiframe alignment signalling with cyclical redundancy checking framing

FE FRA	:display **FE FRA**ming type
FE FRA [FAS|FASCRC| MFASCRC]	:set **FE FRA**ming type
FE SIG	:display **FE SIG**nal format
FE SIG [AMI|HDB3|RZ|NRZ]	:set **FE SIG**nal format
FE CLO	:display **FE** output **CLO**ck source
FE CLO [INT|EXT|REC]	:set **FE** output **CLO**ck source
FE LBO	:display **FE** Line **B**uild **O**ut
FE LBO [0 DB|-3 DB|-6 DB]	:set **FE** Line **B**uild **O**ut
FE IMP	:display **FE IMP**edance
FE IMP [BAL|UNBAL]	:set **FE IMP**edance

The **FE** command allows the user to display or set any of the F to E setup parameters. These include framing format, signal format, output clock source, output attenuation, and input impedance.

EXAMPLE:

>FE SIG NRZ	:set FE signal format to non-return to zero
>FE IMP BAL	:select 120 ohm balanced impedance

Warning - FE impedance and FE signal format conflict

>	:command is accepted with warning
>FE LBO	:display current line build out
E <- F Line buildout.....0db	
>FE CLO	:display output clock source
E <- F Output clock.....Recovered	
>FE FRA MFAS	:set framing to multiframe

Warning - FE impedance and FE signal format conflict

Warning MFAS and time slot 16 conflict

>	:note that multiframe alignment signalling or multiframe alignment with CRC may be selected with warning

Print INTERCEPTOR Software Revision Level

HELLO :Display the version number

The **HELLO** command prints both the INTERCEPTOR's software revision level and theTTC copyright notice.

EXAMPLE:

>HELLO
(c) Telecommunications Techniques Corporation 1990 V 3.01

HELP [BYE|CLEAR MEMORY|CLS|DATE|DEVICE CLEAR| DISPLAY|ECHO|EF|FE|HELLO|IEC|INP|INS|INT|LOCAL| MODE|OPTIONS|PRI|PROMPT|REM|RES|SIG|TIME|TS| VOL|V24]

The **HELP** command displays all available help information by entering "HELP" followed by a carriage return. Help information on a specific command can be obtained by entering "HELP" followed by the command name and a carriage return.

EXAMPLE:

```
>HELP INP
INP [E[BRIDGE/MONITOR/TERMINATE]] - Display/set E input.
INP [F[BRIDGE/MONITOR/TERMINATE]] - Display/set F input.
>
```

IEC :print the IEC-625 configuration status
IEC [SRQ [DAT|ERR]] :select reason to generate SRQ

The **IEC** command configures the IEC-625 controller/printer port as desired. If **IEC SRQ ERR** is specified, the INTERCEPTOR only generates a service request (SRQ) to indicate that the previously received command was in error. If **IEC SRQ DAT** is specified, the INTERCEPTOR generates an (SRQ) whenever it has data to transmit or whenever the previous command was in error.

EXAMPLE:

```
>IEC                          :print current IEC-625 configuration
                               status

Service Request . . . . . Error
>IEC SRQ DAT                  :generate service request on data for
                               transmit

>
```

Display or Set PCM Input Interface

INP E	:display E side input interface
INP E [BRIDGE|MONITOR| TERMINATE]	:select E side input interface
INP F	:display F side input interface
INP F [BRIDGE|MONITOR| TERMINATE]	:select F side input interface

The **INP** command selects or displays the input PCM interface type.

EXAMPLE:

>INP F MONITOR	:set F PCM interface to monitor
>INP E	:display E side selection
Input E.....Monitor	
>	

Insert Data or VF into 2048 kb/s Line

INS NOT FAS [NO|YES [BXBBBBBB]]	:set NOT FAS word and optionally insert when INSERT TS is ON
INS SIG [OFF|ON [ABCD]]	:insert and optionally set signalling bits
INS TS [OFF|ON]	:insert channel data and NOT FAS word if INSERT NOTFAS YES

The **INS** command inserts seven NOT FAS word bits (INS NOT FAS), the four signalling bits for the first selected timeslot (INS SIG), and data from any interface into N channels (INS TS) into the 2 Mb/s data stream. Note that the INSERT NOT FAS YES command does not insert the NOT FAS WORD unless the INSERT TS command is ON. Note: if a conflict between parameters exists the INS SIG ON and INS TS ON commands are not accepted.

EXAMPLE:

>INS NOT FAS YES 11110000	:set the NOT FAS word
>INS TS ON	:insert the chosen timeslots and the NOT FAS word
>INS SIG ON 1010	:insert the signalling 1010 for the first selected timeslot
>INS NOT FAS NO	:stop inserting NOT FAS word
>	
>INS NOT FAS NO 11100011	
>	

Display or Select Interface

INT	:display selected interface
INT DATA PORT	:select X.21 data port interface
INT VF	:select speaker interface
INT TONE	:select insert 1020 Hz interface
INT BYTE XXXXXXXX	:select insert byte interface
INT G703 [BRIDGE|TERMINATE]	:select G.703 interface

The **INT** command selects the interface to the 2 Mb/s lines.

EXAMPLE:

```
>INT BYTE 11110000          :select byte insert and set byte 11110000
>INT
Interface.....byte
>
```

LOCAL	:return the INTERCEPTOR to local mode
/	:short form for local

The **LOCAL** command allow the user to exit remote operation without affecting the state of the INTERCEPTOR.

EXAMPLE:

>/	:exit remote operation.

Select or Display Mode

MODE :display the current mode
MODE [MON|DIE|DIF] :select a mode

The **MODE** command selects or displays the INTERCEPTOR's three operating modes: MONitor only (**MON**), Drop and Insert E (**DIE**) and Drop and Insert F (**DIF**).

EXAMPLE:

```
>MODE DIF                    :select drop F insert F mode
>MODE
Mode.....Drp & Ins F
>
```

Display Installed Options

OPTIONS :display the installed option boards

The **OPTIONS** command lists the INTERCEPTOR's installed options.

EXAMPLE:

```
>OPTIONS
V.24
RESULTS
>
```

Select Print Options

PRI [RES|CON|SUM]	:print **RES**ults, **CON**trols, or signalling **SUM**mary
PRI [SIG [ON|OFF]]	:enable/disable print on **SIG**nalling event
PRI [ERR [ON|OFF]]	:enable/disable print on **ERR**or event
PRI [TIM [OFF|(INTERVAL)]	:select a print results time interval (see text)
PRI [TER [NONE|CR|LF|CRLF]]	:select the print line terminator
PRI [INT [V.24|IEC-625]]	:select/display printer **INT**erface

The **PRI** command enables any of three print summaries (results, controls or signalling) or sets any of the print options (print on signalling event, error event, or timed interval). The time intervals which can be specified are 1 MIN, 5 MIN, 15 MIN, 30 MIN, 1 HOUR, 2 HOUR, 3 HOUR, 4 HOUR, 5 HOUR, 6 HOUR. The **PRI** command also selects a print line terminator, printer interface, or printout direction.

EXAMPLE:

>PRI CON	:print the summary of control setting
.	
.	
.	
>PRI TIM 1 HOUR	:print the results summary every hour
>PRI ERR ON	:print error and time on error event
>PRI TER CRLF	:set the print line terminator to CRLF
>	

Turn Prompt On or Off

PROMPT [ON|OFF|NEW X] :turn prompt on or off or specify a new prompt

The **PROMPT** command allows the user to either turn the prompt character on or off or change the prompt character. The prompt may only be one character.

EXAMPLE:

```
>PROMPT ON                    :enable prompt
>PROMPT NEW *                 :change the prompt character to an asterisk
*
*
```

REM	:print the print format status
REM TER	:display remote line terminator
REM TER [CR|LF|CRLF|NONE]	:select the line terminator for remote interface
REM INT	:display remote interface
REM INT [IEC-625|V.24]	:select the remote interface

The **REM** command allows the user to configure the Remote Control Interface and line terminator.

EXAMPLE:

>REM INT	:display current Remote Interface
Remote Interface.....V.24	
>REM INT IEC-625	:set Remote Interface to IEC-625
>REM INT	
Remote Interface.....IEC-625	
>REM TER CRLF	:set remote interface terminator
>	:to carriage return line feed

Reset Results Counters

RES :reset all results

The **RES** command allows the user to reset all result counters to 0.

EXAMPLE:

```
>RES                    :reinitialize all results counters
>
```

Signalling Source

SIG	:display the signalling source
SIG [EM|ABCD]	:set the signalling source

The **SIG** command displays or selects the signalling source. The signalling source may be the Front Panel ABCD switch or the E&M side connector (when the E&M option is installed). If **SIG ABCD** is specified, the signalling bits can also be set remotely with the INS command.

See also: **INS**

EXAMPLE:

>SIG EM	:select E&M signalling source
>SIG	:display signalling source
Signalling.....E&M	

Set the INTERCEPTOR to Talk to a Dumb Terminal

TERMINAL

:short form of TERMINAL command

The **TERMINAL** command allows the INTERCEPTOR to be controlled from a dumb terminal. Specifically, it sets the following modes:

ECHO ON :turn echo and destructive backspaces on

PROMPT ON :and turn on the command prompt

The **TERMINAL** command is typically used as a terminal "log-in" sequence just after the INTERCEPTOR is powered up. The user need only type a period (".") and a <RETURN> to get the INTERCEPTOR's attention and have a log-in message printed on the screen (verifying proper cable hook-up).

NOTE: If noise affects the performance of the V.24 line during the power-up sequence, it may be necessary to repeat the (".") <RETURN> sequence for a second time to successfully log in to the INTERCEPTOR.

See also: **ECHO, PROMPT, V24, IEC, PRI, REM**

EXAMPLE:

:assume that the INTERCEPTOR has just been turned on and the user types "." and a <RETURN>, which the INTERCEPTOR will not echo.

Terminal Mode Initiated.
Type "HELP" followed by a <RETURN> for help.

Time

TIME	:display the time
TIME (hh:mm) [AM|PM]	:set the time of day

This command sets and displays the time. The time is entered in 12-hour format.

EXAMPLE:

>TIME 7:40 PM	:set the time (7:40 PM)
>TIME	:print the time
7:40:20 PM	
>	

TS

Set or Display Time Slot and Rate

TS E [INS|DRP [N1,N2,N3-N4]] :set or display E side timeslots
TS F [INS/DRP [N1,N2,N3-N4]] :set or display F side timeslots
TS RATE [(N x 64 RATE)] :set or display the Nx64 rate

The **TS** command sets or displays the timeslot and rate data.

EXAMPLE:

>TS E DRP 1,3,5,18-24 :drop timeslots 1, 3, 5, 18, 19, 20, 21, 22, and 23 and 24 from the E to F 2 Mb/s bit stream

>TS E INS 2-7,29-31 :insert timeslots 2, 3, 4, 5, 6, 7, 29, 30 and 31 into the F to E 2 Mb/s bit stream

>TS F DRP 1-3,5-7,9-12 :drop timeslots 1, 2, 3, 5, 6, 7, 9, 10, 11 and 12 from F to E 2 Mb/s bit stream

>TS F INS 10-20 :insert timeslots 10, 11, 12, 13, 14, 15, 17, 18, 19, and 20 into E to F 2 Mb/s bit stream. Note that timeslot 16 is not set if the selected 2 Mb/s bit stream is set to MFAS.

>TS RATE 640 :set rate to 10 timeslots. Note the rate and the number of time slots selected must all match in order to perform a drop and insert. For example, if 1 timeslot is selected in each drop and insert, 64 kb/s rate must be selected; if 2 timeslots are chosen in each drop and insert, 128 kb/s rate must be selected, etc.

Set Speaker Volume

VOL (0-14) :set volume level

The **VOL** command sets or displays the INTERCEPTOR's speaker volume level. The volume level can vary from 0 (off) to 14 (loudest level).

EXAMPLE:

```
>VOL
VOLUME.....0
>VOL 14                    :set maximum volume
>
```

Asynchronous Character Format

V24	:print V.24 characteristics
V24 [DAT [7|8]]	:select number of data bits
V24 [PAR [EVE|ODD|NON]]	:select parity
V24 [STO [1|1.5|2]]	:select number of stop bits
V24 [BAU [110|300|600|1200|2400|4500|9600]]	:select baud rate

The **V.24** command selects or prints the asynchronous character format.

EXAMPLE:

>V24	:print current character format ...
Data 8	
Parity.....Even	
Stop bits.....1.5	
Baud Rate.....9600	
>V24 PAR EVE	:...then select even parity
>	

5.10 INTERCEPTOR ERROR MESSAGES

An error message indicates that the INTERCEPTOR found something wrong with a remote control command and, therefore, did not process it.

Log in error (. <cr>)
The user has entered an invalid log-in command.

Error - Escape sequence not supported
The user has entered an invalid escape sequence.

Error - Control sequence not supported
The user has entered an invalid control character.

Error - Command not accepted because of parameter conflict!!!!!
The user has attempted to insert with one or more parameters conflicting. Possible parameter conflicts include: Time slots not matching rate, RS or NRZ selected with Balanced input and time slot 16 selection with MFAS or MFAS-CRC mode selection.

Error - Invalid Time
The user has attempted to enter an invalid or incomplete time with the TIME command.

Error - Invalid Date
The user has attempted to enter an invalid or incomplete date with the DATE command.

Command syntax error
The INTERCEPTOR was unable to decode the user's command.

Error - G703 board not installed
The user has attempted to select an uninstalled G.703 board.

Error - E and M signalling board not installed
The user has attempted to select an uninstalled E and M board.

Error - V.24 board not installed
The user has attempted to select or access a V.24 board which is uninstalled.

Error - IEC-625 board not installed:
The user has attempted to select or access a IEC-625 board which is uninstalled.

Error - Results board not installed
The user has attempted to view or use an unavailable result.

Error - Signalling is 4 bits
The user has entered less than 4 bits for signalling in the INS SIG command.

Error - Invalid slot value
The user has entered a time slot value not in the 1 to 31 range.

Error - Invalid volume value
The user has entered a volume value not in the range 0 to 14.

A warning indicates that the remote control command was accepted but an insert will not be allowed until the conflict is resolved.

Warning - Time slots do not match rate
The currently selected rate does not match one or more of the drop or insert time slot selections.

Warning - EF Impedance and EF Signal Format conflict
A signal format of RZ or NRZ is selected while the input impedance is unbalanced.

Warning - MFAS and time slot 16 conflict
Time slot 16 has been selected and the framing pattern is MFAS or MFAS-CRC.

OPTIONS AND ACCESSORIES

6.1 INTRODUCTION

This section describes the options and accessories available with the INTERCEPTOR 264.

6.2 OPTIONS

The options that are currently available with the INTERCEPTORare as follows:

Option 001	Results
Option 002	V.24 Printer/Remote Control Interface
Option 003	IEC-625 (IEEE-488) Remote Control Interface
Option 004	64 kb/s Codirectional G.703 Interface with E&M Signalling
Option 005	BNC Connectors for 2048 kb/s Unbalanced Inputs/Outputs
Option 006	E&M Signalling Interface

6.2.1 Results Option

The Results Option provides the INTERCEPTOR with enhanced monitoring capabilities. When this option is installed, the instrument simultaneously measures frame (FAS) errors, multiframe (MFAS) errors, CRC4 errors, and code errors on the E SIDE and F SIDE 2048 kb/s data streams. This option also allows the INTERCEPTOR to compute an average error rate for each measurement. The paragraphs that follow describe each measurement in detail.

FAS ERRORS are detected when an error is received in the frame alignment signal (FAS). The FAS ERROR RATE is the number of FAS errors detected divided by the number of frames sampled.

MFAS ERRORS are detected when an error is received in the multiframe alignment signal (FAS). The MFAS ERROR RATE is the number of MFAS errors detected divided by the number of multiframes sampled. These errors are detected only when the INTERCEPTOR is in MFAS or MFAS-CRC modes.

CRC4 ERRORS are detected when an error is received in the CRC4 polynomial. The CRC4 ERROR RATE is the number of CRC4 errors divided by the number of CRC4 polynomials sampled. These errors are detected only when the INTERCEPTOR is in FAS-CRC or MFAS-CRC modes.

CODE ERRORS are detected when the INTERCEPTOR is configured for AMI or HDB3 coding. In AMI mode, code errors count the number of bipolar violations (BPVs) detected; in HDB3 mode, the options counts any invalid HDB3 coding as well as any unexpected BPVs. The CODE ERROR RATE is the number of code errors detected divided by the number of bits sampled.

6.2.2 V.24 Printer/Remote Control Interface

The V.24 Printer/Remote Control Interface allows the INTERCEPTOR to communicate with an external RS-232 printer. Using this option, the user can obtain printouts of INTERCEPTOR control set-ups and results, and record changes in signalling and error events in programmable increments of time. This option also allows for remote control of the INTERCEPTOR from a dumb terminal or a computer. The V.24 Printer/Remote Control Interface is described in detail in Section 5 of this manual.

6.2.3 IEC-625 (IEEE-488) Remote Control Interface

The INTERCEPTOR IEC-625 Remote Control Interface complies with the IEEE Standard Digital Interface for Programmable Instrumentation (STD 488-1978). The interface operates in both talk-only and addressable modes. In talk-only mode, the INTERCEPTOR should be connected to a listen-only printer. In addressable mode, the INTERCEPTOR may be connected with up to 14 other devices, one of which must be a controller. The IEEE-625 Remote Control Interface is described in detail in Section 5 of this manual.

6.2.4 64 kb/s Codirectional G.703 Interface with E&M Signalling

The 64 kb/s Codirectional G.703 Interface provides drop and insert access to a 64 kb/s timeslot by a 64 kb/s G.703 test instrument. Such access is available on both the E SIDE and F SIDE 2048 kb/s data streams.

Communication with the interface is carried out over a balanced shielded pair. The receiver presents a 120-ohm load to the transmitter when in TERMINATE mode, and over 1000 ohms when in BRIDGE mode. Data from a G.703 transmitter is decoded in accordance with CCITT Recommendation G.703 for 64 kb/s Codirectional G.703 Interfaces and grouped into octets for insertion onto the 2048 kb/s data stream. Octet timing is derived from the transmitted data by detecting forced BPVs. Data dropped from the 2048 kb/s data stream is encoded with octet timing in accordance with CCITT G.703 and transmitted to an external G.703 test instrument over a balanced shielded pair. In monitor mode, the G.703 Interface outputs the timeslots selected from both the E SIDE and the F SIDE 2048 kb/s data streams to G.703 equipment.

The integral E&M signalling interface provides signalling drop and insert access to timeslot 16 on the E SIDE or F SIDE 2048 kb/s data stream from E&M signalling equipment. The input (M-lead) of the E&M signalling interface detects two conditions from the signalling equipment: EARTH-ON and EARTH-OFF. When the E&M signalling option is selected as the signalling source, the INTERCEPTOR inserts the proper ABCD codes into Timeslot 16 for the timeslot selected (in accordance with Signalling System DC5-A). The output (E-lead) is switched between the EARTH-ON and EARTH-OFF conditions in accordance with the ABCD signalling codes dropped from Timeslot 16 for the selected timeslot. In monitor mode, the E&M signalling interface outputs the signalling information received for the timeslots selected on both the E SIDE and the F SIDE 2048 kb/s data streams to E&M signalling equipment.

6.2.5 BNC Connectors for 2048 kb/s Unbalanced Inputs/Outputs

The INTERCEPTOR user is normally provided with 1.6-5.6 connectors for the unbalanced input/output jacks. This option must be ordered for INTERCEPTOR applications that require BNC connectors for these jacks.

6.2.6 E&M Signalling Interface

The E&M Signalling Interface provides signalling drop and insert access to timeslot 16 on the E SIDE or F SIDE 2048 kb/s data stream from E&M signalling equipment. The input (M-lead) of the E&M signalling interface detects two conditions from the signalling equipment: EARTH-ON and EARTH-OFF. When the E&M signalling option is selected as the signalling source, the INTERCEPTOR inserts the proper ABCD codes into Timeslot 16 for the timeslot selected (in accordance with Signalling System DC5-A). The

conditions in accordance with the ABCD signalling codes dropped from Timeslot 16 for the selected timeslot. In MONITOR mode, the E&M signalling interface outputs the signalling information received for the timeslots selected on both the E SIDE and the F SIDE 2048 kb/s data streams to E&M signalling equipment.

6.3 ACCESSORIES

The following accessories are currently available for the INTERCEPTOR.

Item	Order No.
Lid Printer	PTR100
Rack Mount	RM264
Soft Carrying Case	10171
WECO 310 Plug to WECO 310 Plug (1.2m)	10598
WECO 310 Plug to WECO 310 Plug (3m)	10420
WECO 310 Plug to Alligator Clips (3m)	10558
WECO 310 Plug to Bantam Plug (1.2m)	10599
WECO 310 Plug to Bantam Plug (3m)	10559
WECO 310 Plug to Double Banana (1m)	10010
RS449 (V.10/V.11) DTE 37-Pin D to X.21 DTE 15-Pin D (2m)	10562
Siemens 3-Pin to Seimens 3-Pin (3m)	30687
Siemens 3-Pin to Bantam Plug (2m)	30761
Siemens 3-Pin to WECO 310 Plug (2m)	30777

OPTIONS AND ACCESSORIES

6.1 INTRODUCTION

This section describes the options and accessories available with the INTERCEPTOR 264.

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The Results Option provides the INTERCEPTOR with enhanced monitoring capabilities. When this option is installed, the instrument simultaneously measures frame (FAS) errors, multiframe (MFAS) errors, CRC4 errors, and code errors on the E SIDE and F SIDE 2048 kb/s data streams. This option also allows the INTERCEPTOR to compute an average error rate for each measurement. The paragraphs that follow describe each measurement in detail.

FAS ERRORS are detected when an error is received in the frame alignment signal (FAS). The FAS ERROR RATE is the number of FAS errors detected divided by the number of frames sampled.

MFAS ERRORS are detected when an error is received in the multiframe alignment signal (FAS). The MFAS ERROR RATE is the number of MFAS errors detected divided by the number of multiframes sampled. These errors are detected only when the INTERCEPTOR is in MFAS or MFAS-CRC modes.

CRC4 ERRORS are detected when an error is received in the CRC4 polynomial. The CRC4 ERROR RATE is the number of CRC4 errors divided by the number of CRC4 polynomials sampled. These errors are detected only when the INTERCEPTOR is in FAS-CRC or MFAS-CRC modes.

CODE ERRORS are detected when the INTERCEPTOR is configured for AMI or HDB3 coding. In AMI mode, code errors count the number of bipolar violations (BPVs) detected; in HDB3 mode, the options counts any invalid HDB3 coding as well as any unexpected BPVs. The CODE ERROR RATE is the number of code errors detected divided by the number of bits sampled.

6.2.2 V.24 Printer/Remote Control Interface

The V.24 Printer/Remote Control Interface allows the INTERCEPTOR to communicate with an external RS-232 printer. Using this option, the user can obtain printouts of INTERCEPTOR control set-ups and results, and record changes in signalling and error events in programmable increments of time. This option also allows for remote control of the INTERCEPTOR from a dumb terminal or a computer. The V.24 Printer/Remote Control Interface is described in detail in Section 5 of this manual.

6.2.3 IEC-625 (IEEE-488) Remote Control Interface

The INTERCEPTOR IEC-625 Remote Control Interface complies with the IEEE Standard Digital Interface for Programmable Instrumentation (STD 488-1978). The interface operates in both talk-only and addressable modes. In talk-only mode, the INTERCEPTOR should be connected to a listen-only printer. In addressable mode, the INTERCEPTOR may be connected with up to 14 other devices, one of which must be a controller. The IEEE-625 Remote Control Interface is described in detail in Section 5 of this manual.

6.2.4 64 kb/s Codirectional G.703 Interface with E&M Signalling

The 64 kb/s Codirectional G.703 Interface provides drop and insert access to a 64 kb/s timeslot by a 64 kb/s G.703 test instrument. Such access is available on both the E SIDE and F SIDE 2048 kb/s data streams.

Communication with the interface is carried out over a balanced shielded pair. The receiver presents a 120-ohm load to the transmitter when in TERMINATE mode, and over 1000 ohms when in BRIDGE mode. Data from a G.703 transmitter is decoded in accordance with CCITT Recommendation G.703 for 64 kb/s Codirectional G.703 Interfaces and grouped into octets for insertion onto the 2048 kb/s data stream. Octet timing is derived from the transmitteddataby detecting forced BPVs. Data dropped from the 2048 kb/s data stream is encoded with octet timing in accordance with CCITT G.703 and transmitted to an external G.703 test instrument over a balanced shielded pair. In monitor mode, the G.703 Interface outputs the timeslots selected from both the E SIDE and the F SIDE 2048 kb/s data streams to G.703 equipment.

The integral E&M signalling interface provides signalling drop and insert access to timeslot 16 on the E SIDE or F SIDE 2048 kb/s data stream from E&M signalling equipment. The input (M-lead) of the E&M signalling interface detects two conditions from the signalling equipment: EARTH-ON and EARTH-OFF. When the E&M signalling option is selected as the signalling source, the INTERCEPTOR inserts the proper ABCD codes into Timeslot 16 for the timeslot selected (in accordance with Signalling System DC5-A). The output (E-lead) is switched between the EARTH-ON and EARTH-OFF conditions in accordance with the ABCD signalling codes dropped from Timeslot 16 for the selected timeslot. In monitor mode, the E&M signalling interface outputs the signalling information received for the timeslots selected on both the E SIDE and the F SIDE 2048 kb/s data streams to E&M signalling equipment.

6.2.5 BNC Connectors for 2048 kb/s Unbalanced Inputs/Outputs

The INTERCEPTOR user is normally provided with 1.6-5.6 connectors for the unbalanced input/output jacks. This option must be ordered for INTERCEPTOR applications that require BNC connectors for these jacks.

6.2.6 E&M Signalling Interface

The E&M Signalling Interface provides signalling drop and insert access to timeslot 16 on the E SIDE or F SIDE 2048 kb/s data stream from E&M signalling equipment. The input (M-lead) of the E&M signalling interface detects two conditions from the signalling equipment: EARTH-ON and EARTH-OFF. When the E&M signalling option is selected as the signalling source, the INTERCEPTOR inserts the proper ABCD codes into Timeslot 16 for the timeslot selected (in accordance with Signalling System DC5-A). The output (E-lead) is switched between the EARTH-ON and EARTH-OFF

conditions in accordance with the ABCD signalling codes dropped from Timeslot 16 for the selected timeslot. In MONITOR mode, the E&M signalling interface outputs the signalling information received for the timeslots selected on both the E SIDE and the F SIDE 2048 kb/s data streams to E&M signalling equipment.

6.3 ACCESSORIES

The following accessories are currently available for the INTERCEPTOR.

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Lid Printer	PTR100
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WECO 310 Plug to Bantam Plug (3m)	10559
WECO 310 Plug to Double Banana (1m)	10010
RS449 (V.10/V.11) DTE 37-Pin D to X.21 DTE 15-Pin D (2m)	10562
Siemens 3-Pin to Seimens 3-Pin (3m)	30687
Siemens 3-Pin to Bantam Plug (2m)	30761
Siemens 3-Pin to WECO 310 Plug (2m)	30777

SPECIFICATIONS

7.1 INTRODUCTION

This section contains the specifications for the INTERCEPTOR 264 Channel Access Monitor.

7.2 MODES OF OPERATION

N x 64 kb/s contiguous and non-contiguous (X.21 Data Port) drop and insert.
E&M channel-associated signalling.
ABCD channel-associated signalling.
64 kb/s codirectional G.703 drop and insert.
Voice frequency drop and insert.
Byte drop and insert.
Insert 1020 Hz 0 dBm tone (digital milliwatt).

7.3 INDICATORS

The following indicators are provided for each 2048 kb/s data input.

Signal
Frame Sync
Multiframe Sync
CRC Present
HDB3 Code
AIS
TS-16 AIS
FAS Distant Alarm
MFAS Distant Alarm
64 kb/s AIS
A, B, C, and D signalling

7.4 RESULTS

Standard Results:	Received Byte. Frame Word. Not Frame Word. Receive Frequency.
Optional Results:	Code Errors and Rate. Frame Errors and Rate. Multiframe Errors and Rate. CRC Errors and Rate.

7.5 2048 kb/s INTERFACE

Coding:	AMI, HDB3, RZ, NRZ.
Input Impedance:	
Bridged:	> 1000 ohms.
Terminated:	Balanced 120 ohms ±5%. Unbalanced 75 ohms ±5%.
Monitor:	Balanced: 120 ohms ±5%, will recover data resistively attenuated from 20 dB to 30 dB. Unbalanced: 75 ohms ±5%, will recover data resistively attenuated from 20 dB to 30 dB.
Input Range:	
AMI and HDB3:	+3 dB to -18 dB.
RZ, NRZ:	Mark > 2.0V. Space < .7V.

The nominal balanced input level is ±3V; the nominal unbalanced input level is ±2.37V (in accordance with CCITT G.703).

Jitter:	In accordance with CCITT G.823.

Outputs:	
Balanced:	120 ohms ±5%.
Mark Voltage:	3V ±0.3V.
Space Voltage:	0V ±0.3V.
Attenuation:	0 dB, 3 dB, 6 dB.
Unbalanced HDB3 or AMI:	75 ohms ±5%.
Mark Voltage:	2.37V ±.237V. 0V ±.237V.

Both outputs in accordance with CCITT G.703.

RZ and NRZ: TTL compatible into a 75-ohm load.

Framing:	Any combination of CCITT G.704 framing, multiframing, and CRC4 multiframing.
Transmit Timing Sources:	Recovered Clock. External Clock. Internal Clock.
Connectors:	
Balanced:	Three-pin banana.
Unbalanced:	1.6 - 5.6 (standard) or BNC (Option 005).

7.6 DROP AND INSERT DATA PORT INTERFACE

Date Rate:	64 kb/s to 1984 kb/s in 64 kb/s increments (contiguous or non-contiguous).
Connector:	15-pin "D" data connector.
Input Signal Range:	0.250V to 3V.
Output Signal:	
Mark:	1.0V ±0.1V.
Space:	0V ±0.1V.
15-pin D Connector Pin-Outs:	See Table 7-1.

Table 7-1
15-Pin D Connector Pin-Outs

Pin No.	Name	Description
1	Shield	Chassis Ground
2	Transmit (A)	+Input: Input data for insertion
9	Transmit (B)	-Input: Input data for insertion
3	Control (A)	+Input: Not used
10	Control (B)	-Input: Not used
4	Receive (A)	+Output: Output dropped data
11	Receive (B)	-Output: Output dropped data
5	Indication (A)	+Output: Not used
12	Indication (B)	-Output: Not used
6	Signal Element Timing (A)	+Output: N x 64 kb/s clock
13	Signal Element Timing (B)	-Output: N x 64 kb/s clock
7	Byte Timing (A)	+Output: Byte clock
14	Byte Timing (B)	-Output: Byte clock
8	Ground	Signal ground

The preceding pin-outs are for Drop and Insert E or Drop and Insert F modes. For MON E, MON F mode, Pins 2 and 9 become outputs for the E side and Pins 4 and 11 are outputs for the F side.

7.7 64 kb/s G.703 Codirectional Interface

Data Rate:	64 kb/s.
Connector:	Two three-pin banana jacks.
Input Signal:	1.0V ±0.1V (attenuated up to -3 dB at 128 kHz). Single pulse width 3.9 µs nominal. Double pulse width 7.8 µs nominal. In accordance with CCITT G.703.
Input Signal Range:	±2.0V to ±.5V.

Input Impedance:	
Terminated:	Balanced 120 ohms ±5%.
Bridged:	>1000 ohms.
Coding:	Mark is coded as (1100) (64 kHz). Space is coded as (1010) (128 kHz).
Electrical Format:	Blocked AMI with forced BPV to mark bit 8.
Output Pulse:	1.0V ±0.1V Single pulse width 3.9 µs nominal. Double pulse width 7.8 µs nominal. In accordance with CCITT G.703.
Output Impedance:	Balanced 120 ohms ±5%.
Jitter:	In accordance with CCITT G.823.

7.8 DROP AND INSERT VF INTERFACE

Connector:	Three pin banana.
Input Signal Range:	+3 dBm to -40 dBm.
Output Signal:	+3 dBm to -40 dBm.
Impedance:	600 ohms. VF may also be monitored and transmitted through the panel-mounted speaker.

7.9 VF SIGNALLING DROP AND INSERT

Signalling Monitor:	ABC&D bits displayed for each direction on two sets of LEDs.
Signalling Insert:	Four switches control ABC&D insertion for the selected channel.

7.10 E&M SIGNALLING DROP AND INSERT

Input Impedance (M-Lead):	
Earth-on (busy condition):	1,200 ohms in parallel with 1μF.
Earth-off (free condition):	>400 K ohms in parallel with 1μF.
Input Current:	<25 mA with 1,140 ohms to earth. > 5 mA with 1,500 ohms to earth.
Connector:	Three-pin banana jack.
Output Impedance (E-Lead):	
Earth-on (busy condition):	1,200 ohms in parallel with 1μF.
Earth-off (free condition):	>400 Kohms in parallel with 1μF.
PCM Coding:	Earth-on is coded as 0101 (ABCD) on Timeslot 16. Earth-off is coded as 1101 (ABCD) on Timeslot 16.
Output Coding:	E-lead is earthed when 0101 or 0111 is dropped from timeslot 16.

7.11 SIDE PANEL TEST POINTS

The following test points are provided with connectors suitable for oscilloscope probe attachment.

7.11.1 Output Test Points

All outputs HC- and TTL-compatible. All signals are referenced to signal ground.

RX DATA	Received Data
RX CLOCK	Received Clock
TX DATA	Transmit Data
TX CLOCK	Transmit Clock
CRC ERR	CRC Error Pulse
RED ALARM	Loss of Frame Pulse
FRM SYNC	Frame Sync Pulse
FRM ERR	Frame Error Pulse

MFRM ERR	Multi Frame Error Pulse
C STROBE	Channel Strobe
CRC PRES	CRC Present Pulse
DROP SIG A	Signalling Data
DROP SIG B	Signalling Data
DROP SIG C	Signalling Data
DROP SIG D	Signalling Data

7.11.2 Input Test Points

INS SIG A	Reserved for future use.
INS SIG B	Reserved for future use.
INS SIG C	Reserved for future use.
INS SIG D	Reserved for future use.

7.11.3 Signal Levels

Logic low output:	0.3V at 1 mA maximum.
Logic high output:	3.5V at 1 mA maximum.
Logic low input:	0.9V maximum.
Logic high input:	3.15V minimum.
Input impedance	2000 ohms minimum.

7.12 CLOCK IN SIDE PANEL CONNECTOR

Input Range:	Mark > 2.0V. Space < .7V.

7.13 CLOCK OUT SIDE PANEL CONNECTOR

TTL-compatible into a 75-ohm load.

7.14 INTERNAL OSCILLATOR ACCURACY

2.048 MHz:	±5 ppm.

7.15 REAL TIME CLOCK

Display Clock Functions:	Hours. Minutes. Seconds. Month. Day. Year.
Printed Clock Functions:	Hours. Minutes. Seconds. Month. Day. Year.
Accuracy:	Typically better than 1 second per day.

7.16 DISPLAY

Display Type:	Vacuum Fluorescent Display.
Display Size:	40 characters (20 characters x 2 lines).
Character Font:	5 x 7 dot matrix and cursor.

7.17 AUDIO INPUT/OUTPUT

A half-duplex speaker/microphone is provided with a push-to-talk button. Speaker volume is adjustable in 3 dB steps.

7.18 ENVIRONMENTAL SPECIFICATIONS

Operating Temperature Range:	0°C to +45°C (+32°F to +113°F).
Storage Temperature Range:	-30°C to +75°C (-22°F to +167°F).

7.19 DIMENSIONS AND WEIGHT

Size:	15.3 cm High x 34.3 cm Wide x 21.6 cm Deep (6 in x 13.5 in x 8.5 in).
Weight:	6.1 kg (13 lbs).

7.20 POWER REQUIREMENTS

NOTE: Serious damage could occur if the voltage selection switch and fuse module are not in the proper position before applying power.

Voltage:	Two user selectable ranges 90-135 VAC, 195-250 VAC.
Frequency:	48-60 Hz.
Power:	110 Volt-Amperes Maximum.
Fuse:	120V position:3 Amperes 250V slow blow.
	240V position:1.5 Amperes 250V slow blow. 3AG type, or 5mm x 20mm.
Connector:	IEC type

MAINTENANCE AND SERVICE

8.1 INTRODUCTION

This section contains information on maintenance and service for the INTERCEPTOR 264, including Bradley's warranty policies and repair procedures.

8.2 MAINTENANCE

8.2.1 In Case of Difficulty

If the unit fails to operate and no front panel indicators illuminate, check the following:

- AC power cord and AC supply
- AC fuse and fuse size

Follow the self-test procedures in Section 2 of this operating manual as an aid in localizing the problem. If the unit continues to be inoperative, refer to the following sections for service information or call Bradley for applications assistance.

8.3 SERVICE

8.3.1 Warranty Policy

All equipment manufactured by the Bradley Division of Telecommunications Techniques Corporation (TTC) is warranted against defects in material and workmanship. This warranty applies only to the original purchaser and is non-transferable unless express written authorization of the warranty transfer is granted by Bradley.

Liability under this warranty extends only to the replacement value of the equipment. The warranty is void under the following conditions.

(1) Equipment has been altered or repaired without specific authorization from Bradley.

(2) Equipment is installed other than in accordance with instructions contained in Bradley literature and operating manuals.

No other warranty is expressed or implied. Bradley is not liable for consequential damages.

8.3.2 In-Warranty Service

Equipment in warranty must be returned to the factory with shipping prepaid. The equipment should be packed and shipped in accordance with instructions in Section 8.3.4 of this manual. Before returning any equipment, the customer must obtain a Return Authorization (RA) number by contacting the Bradley Repair Department. The RA number should then appear on all paperwork and be clearly marked on the outside of the shipping container.

After the equipment is repaired by Bradley, it will be tested to applicable specifications, burned-in for at least 24 hours, retested, and returned to the customer with shipping prepaid. A brief description of the work performed and the materials used will be provided on the Equipment Repair Report furnished with the returned equipment.

8.3.3 Out-of-Warranty Service

The procedure for repairing out-of-warranty equipment is the same as that used for equipment still in warranty. However, there is a minimum charge applied to each request for out-of-warranty service. The minimum charge guarantees the customer an estimate of the repair costs and is used as credit against actual materials and labor costs should the equipment be repaired. Contact the Bradley Repair Department for specific information on the minimum out-of-warranty charge.

The customer will be billed for parts plus standard labor rates in effect at the time of repair. The customer will also be required to furnish a purchase order number before repair work can be started, and a hard copy of the purchase order must be received by Bradley before the repaired equipment may be shipped to the customer. A description of the labor and materials used will be provided in the Equipment Repair Report.

Once an out-of-warranty repair is made, the repaired part or component is warranted for 90 days. This warranty applies only to the part or component that was repaired; other parts or components are not covered under the 90-day repair warranty.

8.3.4 Equipment Return Instructions

To all equipment returned for repair, the customer should attach a tag that includes the following information.

(1) Owner's name and address.

(2) A list of the equipment being returned and the applicable serial number(s).

(3) A detailed description of the problem or service requested.

(4) The name and telephone number of the person to contact regarding questions about the repair.

(5) The Return Authorization (RA) number.

If a mainframe is being returned, it is recommended that all switches be left in the positions they were in when the problem occurred. The interface in use at the time of the failure should also be returned.

If possible, the customer should return the equipment using the original shipping container and material. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit. Bradley is not liable for any damage that may occur during shipping. The customer should clearly mark the RA number on the outside of the package and ship it prepaid and insured to Bradley

For returns from outside of the U.S., please follow steps 1 through 5 and contact your local distributor. The distributor will handle the repair and return to the U.S., if necessary.

ON-LINE MINI-MANUAL

bye	- Return to power-up state
clear memory	- CLEAR all MEMORY and return INTERCEPTOR to factory settings
cls	- Clear the terminal Screen
date [(dd/mm/yy)]	- Display/set DATE
device clear	- Return the INTERCEPTOR to power-up state
display [local/remote]	- Display/set the front panel DISPLAY mode
echo [on/off]	- Display/set controller ECHO mode
ef [fra [mfascrc/mfas/fascrc/fas]]	- Display/set EF FRAming mode
ef [sig [ami/nrz/rz/hdb3]]	- Display/set EF SIGnal format
ef [clo [rec/ext/int]]	- Display/set EF output CLOck source
ef [lbo [0 db/-3 db/-6 db]]	- Display/set EF Line Build Out
ef [imp [bal/unbal/]]	- Display/set EF IMPedance
fe [fra [mfascrc/mfas/fascrc/fas]]	- Display/set FE FRAming mode
fe [sig [ami/nrz/rz/hdb3]]	- Display/set FE SIGnal format
fe [clo [rec/ext/int]]	- Display/set FE output CLOck source
fe [lbo [0 db/-3 db/-6 db]]	- Display/set FE Line Build Out
fe [imp [bal/unbal]]	- Display/set FE IMPedance
hello	- Display the software revision level

help	- Display HELP directory
iec [srq [data/error]]	- Display/set Service ReQuest
inp [e [bridge/monitor/terminate]]	- Display/set E INPut
inp [f [bridge/monitor/terminate]]	- Display/set F INPut
ins [notfas [yes/no BXBBBBBB]]	- Display/set the Not FAS word
ins [sig [on/off ABCD]]	- Display/Insert SIGnalling
ins [ts [on/off]]	- Insert external data into N channels of 2048 Kbps stream
int [vf/dataport/tone /byte [XXXXXXXX] /g703 [bridge/terminate]]	- Display/select INTerface
local	- Return the INTERCEPTOR to local mode
mode [mon/die/dif]	- Display/Set MODE to MONitor or Drp/Ins E or Drp/Ins F
options	- Display OPTIONS currently installed in the INTERCEPTOR
pri [int [V24/IEC-625]]	- Display/set printer INTerface
pri [ter [none/cr/lf/crlf]]	- Display/set print line TERminator
pri [res/con/sum]]	- Print RESults or CONtrols or signalling SUMmary
pri [sig [on/off]]	- Display/set print on SIGnalling event
pri [err [on/off]]	- Display/set print on ERRor event
pri [tim [off/1 min/5 min/15 min /30 min/1 hour/2 hour /3 hour/4 hour/5 hour /6 hour]]	- Display/set auto print result TIMe interval

prompt [on/off/new (prompt)]	- Turn PROMPT ON or OFF or set NEW prompt character
rem [int [v24/iec-625]]	- Display/set REMote INTerface
rem [ter [none/cr/lf/crlf]]	- Display/set REMote INTerface
res	- RESet results
time [sig(hh:mm)[am/pm]]	- Display/set TIME
ts [rate [64/128/192/256/320/ 384/448/512/576/640/ 704/768/832/896/960/ 1024/1088/1152/1216/ 1280/1344/1408/1472/ 1536/1600/1664/1728/ 1792/1656/1920/1984]]	- Display/select an N * 64 Kbps RATE
ts [e [ins/drp (N1,N2,N3 - N4)]]	- Display/select E Time Slots
ts [f [ins/drp (N1,N2,N3 - N4)]]	- Display/select F Time Slots
sig [ABCD/EM]	- Display/Set the SIGnalling source
vol [(0 - 15)]	- Display/Set the VOLume level
V24	- Display V24 interface parameters
V24 [dat [7/8]]	- Display/set the number of DATa bits
V24 [par [eve/odd/non]]	- Display/set the PARity
V24 [bau [110/300/600/1200 /2400/4800/9600]]	- Display/set the BAUd rate
V24 [sto [1/1.5/2]]	- Display/set the number of STOp bits

prompt [on/off/new (prompt)]	- Turn PROMPT ON or OFF or set NEW prompt character
rem [int [v24/iec-625]]	- Display/set REMote INTerface
rem [ter [none/cr/lf/crlf]]	- Display/set REMote INTerface
res	- RESet results
time [sig(hh:mm)[am/pm]]	- Display/set TIME
ts [rate [64/128/192/256/320/ 384/448/512/576/640/ 704/768/832/896/960/ 1024/1088/1152/1216/ 1280/1344/1408/1472/ 1536/1600/1664/1728/ 1792/1656/1920/1984]]	- Display/select an N * 64 Kbps RATE
ts [e [ins/drp (N1,N2,N3 - N4)]]	- Display/select E Time Slots
ts [f [ins/drp (N1,N2,N3 - N4)]]	- Display/select F Time Slots
sig [ABCD/EM]	- Display/Set the SIGnalling source
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